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MADISON BENTLEY, *University of Pennsylvania*
S. W. FERNBERG, *University of Pennsylvania*

The Personalities of the Socially and Mechanically Inclined

A Study of the Differences in Personality Between Men Whose Primary Interest is in Social and Men Whose Primary Interest is in Machines

MAX L. LEVINE, Ph.D.

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The Personalities of the Socially and the Mechanically Inclined

A Study of the Differences in Personality Between
Men Whose Primary Interest is Social and Men
Whose Primary Interest is in Machines

BY

MAX FREYD, PH.D.

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INTRODUCTION

This study was undertaken as a solution not to a practical problem, but to one of a general psychological nature. Its purpose is to add to our knowledge of adult human personality. It was undertaken with the conviction that the study of trends of personality and agreements and disagreements in the reactions of adults to their environment over a period of time, was fundamental to and afforded richer and more valuable fields for psychological inquiry than the analysis of momentary mental states or acts.

Specifically, this study seeks to determine the personality correlates of interest and ability (1) in handling or motivating human beings, and (2) in handling machines or inanimate objects. What is the interrelationship of the differences in personality, and to what extent do these differences connote types or extremes of personality?

In order to arrive at a solution of this problem, comparisons were made between salesmen on the one hand and students of engineering and mechanics on the other. Differences were studied by the use of tests, interest and personal history records, and ratings. Simple group comparisons were made in these measures. An additional statistical method, involving the intercorrelation of these measures, was adopted in order to arrive at a consistent picture of the extremes of divergence between the two groups of subjects.

The results of the group comparisons lead to the conclusion that those who are interested in dealing with human beings (the salesmen) are differentiated from the students of mechanics by greater social ability, credulity or suggestibility, adaptability, excitability, self-confidence, talkativeness, present-mindedness, and good-nature. The students of mechanics show a greater tendency to be self-conscious, careful of details, inhibited and cautious, reticent, absent-minded, and glum. They are more capable of making fine coordinations, and excel in slow, painstaking, and accurate effort. There is no evidence for two corresponding sharply defined types of personality, but evidence points to the utility of recognizing "ex-

tremes," those few at the social extreme possessing all the traits of the completely socially adapted person, and those at the mechanical extreme possessing all of the traits of the person who is completely devoted to machines or inanimate objects. Most individuals will deviate from an absolutely neutral state toward one or the other extreme, depending upon which of the two opposed classes of traits is dominant in the make-up of their personality. A use of this distinction is provided in the present study by the presentation of a composite scoring method which discriminates effectively between the socially adapted and the mechanically adapted.

At a later date the writer expects to show the relation of these results to the concepts of the *introvert* and the *extrovert*, which have been taken over by many psychologists. There is a remarkable correspondence between the traits described in the theoretical literature as native to the introvert and the extrovert and those which differentiate the mechanically inclined from the socially inclined, the mechanically inclined corresponding to the introvert and the socially inclined to the extrovert. The greater objectivity of a distinction based on ability to motivate people and ability to handle machines warrants the use of this criterion for distinguishing the extrovert from the introvert, rather than the criterion of facing reality or withdrawing from it.

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CHAPTER I

THE PROBLEM AND MODES OF ATTACK

THE PROBLEM

The great complexity of behavior of the adult individual seems to offer an almost insurmountable barrier to systematization, yet some sort of an approach must be made toward a classification of people if psychology is to advance toward its goal of the prediction and control of human behavior. The approach to this goal through the study of instincts has failed, for the moment at least, to provide materials for the study of adults; if the reader is in doubt, he need only review the teeming literature on the subject and note the contradictory statements and *ex-cathedra* pronouncements with which it abounds. Genetic studies of instincts reveal little for the understanding of adults; the instincts become so disguised and are expressed in such a multitude of ways as to render any instinctive explanations of conduct mere broad generalizations. Factors other than instinct, such as immediate heredity and early environment, are also important in determining the psychological make-up of the adult. If we are to interest ourselves in adult psychology, we must take the adult as he is, the resultant of a number of forces acting upon him. We must proceed to classify adults as to both qualitative and quantitative differences, just as the zoologist classifies his specimens into phyla, classes, orders, and so forth. Adults have been classified on scales ranging from genius to idiocy, and from sanity to insanity, presumably quantitative and qualitative differentiations. The classifications of adults into types of personality¹ has met with indifferent success.

A certain common-sense attitude toward types of personality cannot be disregarded. Whether as psychologists or laymen, we

¹ By *personality* I mean the sum-total of the reaction tendencies of an individual toward his fellow men, as opposed to his reactions toward inanimate objects. *Character* is personality judged by the moral standards of a particular group.

speak of typical ministers, typical pugilists, typical ward bosses, and so forth. Such individuals constitute types in the sense that they had common interests which led them into the same line of work, where their training put the finishing touches of uniformity on them. While there may not be fundamental psychological differences between people belonging to diverse types, the differences are important, popularly recognized, and relatively permanent.

In approaching the problem of human types from the psychological standpoint, we are immediately confronted with a variety of difficult questions. Is a type distinguished by one central trait, or by a cluster of traits? In how many traits must individuals agree in order to belong to the same type? How close a similarity in any given measured trait shall be accepted as a criterion of agreement? How can the traits be best measured? How important relatively are heredity and environment as factors which place men in types? What is the final proof of the existence of types? The difficulties pointed out show the need for experimental evidence.

The common psychological point of view is against the existence of types. If we set up as our criterion of the existence of types that the individuals belonging to them shall be similar in even the remotest trait, we may as well let the question of types rest as far as any practical applications of our findings are concerned, for the number of persons falling into types if this criterion were maintained would be infinitesimal. If a limited number of traits were accepted as the distinguishing marks of a type, the most favorable place to find types would be among those engaged in the same kind of work. If it can be shown that individuals engaged in the same occupation are not only in agreement in their abilities, interests, and personal history, but also possess the same traits of personality, the results will not only be of theoretical interest, but will be of immediate application in vocational guidance.

For the purpose of investigating the existence of types among vocationally selected people, the writer has made a study of differences between salesmen on the one hand and students of engineering and mechanics on the other. These two opposed groups are characterized most prominently by a social inclination and an ability to motivate others in the case of the salesmen, and a primary

interest in mechanics on the part of the students of engineering and mechanics.

PROCEDURE

A very good statistical consideration of psychological types is to be found in the third volume of Thorndike's *Educational Psychology* (20). He outlines two ways of discovering types:

"The first is by direct measurement of individuals *in toto*, and of their differences . . .

"The second way . . . is by discovering what each amount possessed of any trait implies concerning the individual's condition in other traits." (pp. 347-348)

In a detailed consideration of these methods and the results obtained with their use, Thorndike comes to the conclusion that the data at hand do not warrant the statement that types exist; that the most probable condition of an individual is one of mediocrity in most traits, with slight variations toward extremes in the remainder of the traits. His main argument against the existence of types is that distributions of various traits or combinations of traits are unimodal, whereas if types existed each type would be represented by a mode in the distribution curve. The unimodal distribution curves argue for a single type—mediocrity.

Regarding the first method, Thorndike states that no individual has ever been measured *in toto*. Even in cases of the most thorough measurements no great similarities between individuals have been found. The difficulty of the first method leads us naturally to the second. Why measure all the individual's traits if one trait may stand for the amount possessed of any of a number of traits which intercorrelate highly? Thorndike's conclusion on this point, based on such data as he could obtain, is as follows (p. 362):

"It is very, very hard to find any case of a negative correlation between desirable mental functions. Divergence toward what we vaguely call better adaptation to the world in any respect seems to be positively related to better adaptation in all or nearly all respects. And this seems especially true of the relations between original capacities."

A great deal hinges on the use of the word "desirable"; and in

so far as the conclusions are based on ratings the effect of "halo," which Thorndike has since called to attention, cannot be disregarded. The view here presented is in conflict with the popular conception, which is without statistical corroboration, that maladaptation toward life in one respect is compensated for in other respects.

The word "extremes" may be substituted for "types" and applied to those individuals who are beyond certain points on the distribution curves of a given trait or combination of traits. In doing this, we implicitly admit that most individuals belong definitely to no particular extreme or type. If all desirable traits tend to intercorrelate highly we should expect to find in a distribution of a combination of traits extreme individuals who would agree in possessing a great many undesirable traits or a great many desirable ones. At any point in the distribution curve we should expect to find individuals who agree in their possession of the intercorrelating traits.

In the light of the propositions set forth by Thorndike, the following methods were decided upon for use in this study:

1. Two groups, differing in one important attribute (inclination toward mechanical or social occupations), were compared in a wide series of measures of their abilities, interests, and personality traits. Where appreciable differences in distributions were found, the groups were said to differ in the traits measured. By summing up the traits in which significant differences were found, a characterization was obtained of the extreme socially inclined person as opposed to the extreme mechanically inclined person. The results were checked up on other similar groups where the data were available. The fundamental consideration was to determine the differences in personality between the two groups.

2. The measurements were intercorrelated, using the data from only one group, in order to find out which traits or abilities were concomitant or formed constellations within that group of persons. If with the data from this group we should find Traits A, B, and C to be those which are distinguished from the remaining traits by virtue of the fact that they show the highest intercorrelations and do not show consistently high correlations with any other traits,

we should interpret this to mean that the group in question was characterized by these three traits. Each of the traits would be accompanied by approximately equal amounts of the other two traits in any individual in the group, even though the whole range of the traits in question were represented in the group of persons. This procedure was repeated with the data from the remaining occupational group. The constellations of traits were further interpreted by referring to the group comparisons in these traits, in order to determine if one group excelled the other in all the traits entering into its constellation. If Traits A, B, and C also formed a constellation for the second group, and if the first group excelled the second in all three traits, we should conclude that we had the nucleus at least of a character type distinction.

3. In a similar way, each measurement was correlated with each of the other measurements, with the combined data from all of the groups. The aim in this case was to determine which traits formed constellations regardless of groups, or rather in the general population. Having obtained the constellation of traits, it remained to compare the groups in their possession of these traits in order to observe if one group consistently excelled the other in its possession of the traits. The conclusions to be drawn from positive results with the use of this procedure would be that differences between groups as regards social or mechanical interests were correlated with the character traits which entered into the constellation. If the intercorrelations of the traits in the constellation were high, it should be possible to make a distribution curve for the constellation. The two occupational groups should occupy distinctly separate positions on this distribution curve.

4. A combined score was obtained, the components of which were scores in those measurements found to be significant for differentiating the groups. The reliability for differentiating purposes of this combined score should be greater than any of its components. The results of this method are of more practical than theoretical interest, since they show an immediate application of the group comparisons to vocational guidance.

More detailed discussions of these methods will be given in later chapters in connection with the explanations of the results obtained with their use.

SUBJECTS

The men who served as subjects for this study fall into two general classes: those who are mechanically inclined and those who are socially inclined. Each of the classes may be subdivided into primary and secondary groups. A wide series of test measurements, answers to questionnaires, and ratings were obtained on the two primary groups. Where results were available on the secondary groups they were used as checks on the results obtained with the primary groups.

In order to obviate any possible sex differences, only men were used in this study, with the exception of a very small percentage of one of the secondary groups.

Primary Mechanical Group. This group consisted of thirty seniors in the College of Industries at Carnegie Institute of Technology, tested in the fall of 1921. These men were in the fourth year of a curriculum designed to prepare them for executive positions in industry. Their courses were practical, and to a large extent consisted of laboratory work in the occupations in which they aimed to become executives. The departments of instruction included the following: Building Erection and Estimating; Electrical Equipment and Construction; Cost and Factory Accounting; Machinery Production; Power Plant Operation and Management; Printing Industry; and Heating, Ventilating, and Sanitary Equipment. While these men are prepared to become industrial executives, the problem of motivating others forms a very small proportion of their duties. It is safe to say that their success is largely dependent on their technical information and ability, and that their interests and abilities are predominantly technical and mechanical, rather than social. Ability to motivate others does not enter into their tasks in the sense that it enters into the work of the salesman. Their prestige as executives will rest mainly on their technical background. To motivate others they need only give orders. The salesman, on the other hand, requires a complex social ability in order that he may motivate others, and can in no sense rely on authority in accomplishing that motivation. He must rely on his own persuasive ability and personality, and must be actuated by an interest in motivating people. In their daily behavior the in-

dustries seniors displayed markedly the fact that their abilities were overwhelmingly mechanical rather than social, in comparison with the groups of salesmen who were studied.

Primary Social Group. The social groups consisted in all cases of salesmen. The primary group was composed of thirty men chosen from the School of Life Insurance Salesmanship, Fall Class, 1921-22, at Carnegie Institute of Technology. This school consists of a course of eleven weeks' duration, which is repeated three times a year. It draws representative men with sales interests from the various corners of the country. The thirty men chosen out of the class of approximately sixty were those who stood highest in the tests developed by Ream (17) for the prediction of life insurance salesmanship. The probability is high that these men will sell more life insurance than the remaining thirty men in the class. To some extent the tests used in the selective process were such as to cause wider divergences between this group and the primary mechanical group than would be expected if no selective process were used. In most cases, however, the results of secondary groups were available as checks on our differences. The sales primary group seems well fitted to represent individuals whose interests and abilities are mainly social rather than mechanical in nature. The commodity which they sell is intangible and depends for its appeal largely on the personality and persistence of the salesman. These salesmen have to make as many as forty calls in order to make a sale. In their social contacts the members of this group displayed a more pleasing personality than the industries seniors. There were, of course, a few exceptions, but the statement holds for the majority of the group.

Secondary Mechanical Groups. The following groups of mechanically inclined men were used in obtaining additional evidence on the results obtained with the primary group:

Forty-three seniors in Mechanical Engineering, Class of 1922, Case School of Applied Science, tested in December, 1921.

Seventeen seniors in the College of Industries, Class of 1921, Carnegie Institute of Technology, tested in May, 1921.

Eighteen seniors in Mechanical Engineering, Class of 1921, Carnegie Institute of Technology, tested in May, 1921.

Nineteen seniors in Commercial Engineering, Class of 1921, Carnegie Institute of Technology, tested in May, 1921.

Secondary Social Groups. The following sales groups provided results which were used to supplement the results obtained with the primary sales group:

Thirty men, constituting the remainder of the School of Life Insurance Salesmanship, Fall Class, 1921-22, Carnegie Institute of Technology, tested in October, 1921.

Seventy-six members of the School of Life Insurance Salesmanship, Spring Class, 1920-21, tested in April, 1921.

Fifty members of the School of Life Insurance Salesmanship, Winter Class, 1921-22, tested in January, 1922.

One hundred and thirty-five life insurance salesmen with the Edward A. Woods Company, of Pittsburgh, tested in July, 1921.

Eighty-one salesmen with the Burroughs Adding Machine Company.

Twenty-one salesmen with the Cleveland Discount Company, mainly bond salesmen, tested in November, 1921.

Twenty-four salesmen with the Harrison Real Estate Company, of Buffalo, New York, mainly bond and real estate salesmen, tested in November, 1921.

Forty-nine salesmen with the Procter and Gamble Company, tested in January, 1922.

An additional group on whom limited results were available consisted of thirty-three seniors in the Westinghouse Technical Night School, Class of 1921, East Pittsburgh, Pennsylvania. These men correspond roughly to the Industries groups, but the situation is complicated by the fact that among them were numbers of salesmen employed by the Westinghouse Company who were receiving training in technical work in order to enable them to sell more effectively. Very few of the men indicated on their test blanks the positions they occupied, and we are consequently at a loss as to the inclinations of the majority of the men.

FORMS USED

For purposes of comparing the groups several tests and questionnaires and a rating scale were used. A number of factors op-

erated to limit the scope of the program of forms, among which were: the limit of two hours placed on the program; the fact that only group tests could be used; the range of test forms used in the Bureau of Personnel Research; and the availability of results with the use of the same forms on the secondary groups.

Tests. While the principal stress is laid on differences in personality, an intelligence test was included as a check on the factor of general intelligence in the group differences found. The test used for this purpose was Bureau of Personnel Research Test VI, a spiral-omnibus test with items chosen from the Army Alpha Examination (9). The test was given with a fifteen minute time limit.

A second test was Bureau Test IX, a group modification of the Downey Will-Temperament Test (4, 16). This test series consists of eleven parts, yielding with the use of ratios, twelve scores. This test series was originated by Downey for individual testing of a number of volitional and temperamental traits, using modifications of handwriting for the purpose. In the present study use was made of the fourth edition of a group modification of the test developed by the staff of the Bureau of Personnel Research.

A third test was the Kent-Rosanoff free association test arranged for group testing. In this form, instead of giving his response orally, the subject responds by writing the first word called to mind by the stimulus word. The stimulus words are printed in a list; one signal serves to start the individual on the list and one to stop him. The chief interest in the test lay in the coefficient of commonality of response, and in the classification of responses made by Wells (22, 24).

A fourth test, which I have chosen to call a Directed Association Test, was intended to measure ability at directed thinking, the supposition being that this ability could be measured by the rapidity and brevity with which an individual completed a chain association between two dissimilar words.

Questionnaires. A number of exhaustive questionnaires covering items of personal history, interests, attitudes, etc., were used in order to supplement the measures yielded by the tests. Material for these questionnaires was drawn largely from previous lists prepared in the Bureau of Personnel Research, and from the psychi-

atric and psychoanalytic literature. The fields covered by the several questionnaires are roughly the following:

- Questionnaire 1. Early Personal History.
- Questionnaire 2. Vocational Interests.
- Questionnaire 3. Avocational Interests.
- Questionnaire 4. Likes and Dislikes.
- Questionnaire 5. Beliefs.

Rating Scale. A graphic rating scale (6) was constructed in order to measure a number of traits some of which presumably were brought out by the tests and questionnaires. With the use of the same scale, self-ratings and ratings by friends and acquaintances were obtained, and the groups compared in each of the traits on the scale. The measurements yielded by this scale were also used as a partial check on the validity of the tests, and as materials for the intercorrelation of traits in discovering constellations of traits.

The entire series of measures was obtained on the two primary groups and on the seniors in Mechanical Engineering at Case School of Applied Science. Measures of the remaining groups were incomplete, lacking in every case the ratings, the Directed Association Test, and Questionnaires 1, 3, and 5. In some groups additional measures were missing.

More detailed discussion of the forms used will be found in the following three chapters.

CHAPTER II

GROUP COMPARISONS BASED ON TEST SCORES

THE METHOD

The first method of studying personality types, that of making group comparisons in distributions of abilities, offers no great theoretical or statistical difficulties. This procedure was followed in the present instance in order to form an estimate of the differences between the two primary groups in the selected measures of capacities. Where test results were available on primary and secondary groups, these were combined. The central tendencies of the salesmen and of the mechanics students and the standard error of the difference in central tendencies were then computed, enabling us to place a statistical estimate on the reality of the difference in central tendencies of the two groups. Where test results were available only on the primary groups, the less rigid statistical device was employed of computing the range of scores of the middle 50 per cent of each group in each test (interquartile range), and placing a rough observational estimate on the reliability of the differences. Statistically, if the median of one group is coincident with the first or third quartile of the other group, or, if 25 per cent of one group lie beyond the median of the other group, the group difference is quite significant; with thirty cases in each group the probability is approximately one in fifty that with further sampling the medians will coincide, or that instead of 25 per cent, 50 per cent or more of the one group will lie beyond the median of the other group. With one hundred cases the probability is reduced practically to zero. Where 25 per cent or less of one group lie beyond the median of the other, we shall speak of the difference in that ability as very significant. A rough estimate must be placed on differences which fall short of this criterion.

We cannot, in the absence of correlation coefficients with reliable

ratings, state dogmatically what function is measured by each test, but we can draw a common-sense analogy between the functions involved in the performance of the test and certain psychological concepts. Outlines of experiments for laboratory courses in psychology (the cradle of psychological tests) do not hesitate to name the functions for which each experiment is intended, such as attention, volition, suggestion, association, and the like. In the following discussion of results, I have given the interpretation placed on the tests by the originators or those who have subsequently made use of them. In Chapter 5 mention is made of correlation coefficients obtained between tests and ratings, but in as much as the ratings were secured under conditions more suitable for rough group comparisons than for correlations with tests, they should not be given too much weight in this connection. The rating scale, moreover, does not exhaust the number of possible abilities: there is always the possibility that the test would correlate most highly with a trait not on the scale. These coefficients will be mentioned in connection with the interpretations of the tests.

The comparisons were first made between the two primary groups: seniors in the College of Industries at Carnegie Institute of Technology, and thirty salesmen selected from the School of Life Insurance Salesmanship. Where the differences seemed significant and the same measures were at hand on secondary groups listed in the preceding chapter, the additional results are given.¹

TEST VI. GENERAL INTELLIGENCE

Group comparisons in this test are interesting mainly in so far as they corroborate the aim to eliminate the factor of general intelligence in the group comparisons. The test consists of 184 items selected from six of the tests in the Army Alpha Examination, namely, arithmetical problems, synonym-antonym, disarranged sentences, number series completion, analogies, and information. The directions for all the different forms of tasks are assembled at the beginning of the test. In the body of the test the items are so arranged as to become progressively more difficult. Each type

¹ The test figures for the secondary groups in Test IX were supplied by Mr. L. D. Anderson from unpublished data.

of item occurs at given intervals. The term "spiral-omnibus" has been applied to this test to distinguish it from the earlier "cycle-omnibus" tests in which the various types of task recurred without any progressive increase in difficulty. Its superiority over the army form lies in the greater ease of administering this form and the briefer time required for testing.

In administering the test, four minutes are allowed for reading the directions. At a signal the subjects commence the test and work uninterruptedly for fifteen minutes. Originally twenty-five minutes were allowed, but correlations with scores in the fifteen minute period were so high ($+.96$ and $+.97$) as to warrant using the shorter time limit (9). The different types of items are scored in the same manner as in the Army Alpha Examination, but a separate score for each type of item is not obtained.

The purpose of this test is to measure an individual's mental capacity or general intelligence. "By intelligence is meant ability to think quickly, accurately, and independently; to comprehend new problems; to meet new and difficult situations; to understand and to be able to carry in mind complicated directions, etc." (14, p. 425)

Below are given the interquartile ranges of the two primary groups and the Case School Seniors in Test VI.

	Q_1	Q_2	Q_3
Succ. l. i. salesmen	107.5	117.6	130.0
Industries seniors	97.5	110.3	130.3
Mech. Eng. seniors	105.0	115.0	130.0

The differences are not so great as to place the groups on different mental levels. Test VI correlates uniformly low with the other tests used in this study. We may conclude, therefore, that we have test results on factors other than conceptual intelligence.

TEST IX. WILL-TEMPERAMENT

Although the Downey Will-Temperament Test is of comparatively recent advent in the field of psychological tests, the literature upon it is already quite extensive. A thoroughgoing discussion of the test is, therefore, not in place in this study. The present discussion will be limited to a brief exposition of the form of the

Will-Temperament Test used in this study, and to a reconsideration of the traits which it aims to measure.

The Will-Temperament Test, as originated by Downey (4), is a series of twelve individual tests intended to measure volitional characteristics, so arranged that when the deciles are plotted the volitional pattern or profile of the subject becomes apparent, and his classification with regard to three general volitional types may be determined; the "hair-trigger" type; the wilful, aggressive type; and the sluggish, painstaking type. The extent of each of these three tendencies in his volitional make-up is supposed to be measured by three or four tests. Handwriting is the medium by which Downey arrives at this analysis, but in so doing she makes no graphological assumptions.

"It may be taken for granted that will-functions must be tested largely through some form of motor reaction . . . The motor activity required for the present purpose should be a common one and one which leaves behind it a permanent record. The one I have chosen for exploitation is handwriting; I have introduced modifications of it such as speeded, retarded, blocked, disguised, and automatic writing . . . In addition to writing activity I have included tests involving choice in which the intellectual factor is subordinate to the impulsive one. . . . The choice of particular tests has been motivated largely by previous experimentation on handwriting and, to a lesser degree, on muscle-reading. . . . It should be emphatically stated that the present exploitation of handwriting makes little use of graphic individuality and no use whatever of graphological assumptions. It utilizes the writing movement merely as a convenient method for study of complications of motor impulses." (4, pp. 8-9)

Downey's original test series was intended for individual testing, but she as well as other psychologists have arranged group modifications of the series. The pioneer in this field in the Bureau of Personnel Research is H. A. Richmond. The group form of the test in use by the Bureau has passed into its fifth edition and has been given to over two thousand persons.

The fourth edition of the Bureau modification of the test series was used in this study. It consists of eleven parts, which with the use of ratios yield twelve separate scores. The main difference be-

tween this series and the series for individual testing lies in the substitution of a time limit for a work limit. Although the parts are administered in their numerical order, the scores are obtained and arranged according to Downey's three-fold classification, which has been revised in the light of the intercorrelations of the parts. The order in which the scores are presented is as follows:

- Parts 1 and 10.
- Part 4, ratio.
- Part 3.
- Part 9.
- Part 6, disguises.
- Part 5.
- Part 11.
- Part 9, ratio.
- Part 2.
- Part 8.
- Part 7.
- Part 6, letters.

The first five scores are designed to measure speed of action and decision, the next three aggressiveness and impulsiveness, and the last four capacity for slow, painstaking effort and for making certain motor coordinations. The scores will be discussed in the above order, rather than in their numerical order in the test booklet. In designating the functions measured by these parts, I have relied on the interpretations of Ream (16) and Downey (4).² Some additional scores were obtained and are presented at the conclusion of this discussion.

Parts 1 and 10. Normal Speed of Writing. This is measured by averaging the number of letters written in Parts 1 and 10. In each of these parts the subject is required to write the words "United States" repeatedly in his usual style and at his usual speed. Thirty seconds are allowed for each part. This score correlates $-.37$ with ratings on cautiousness. (This figure and the coefficients which will be given in connection with some of the remaining parts and

² More complete descriptions of the parts are to be found in two publications by Ream (16, 17). Copies of the test booklet may be obtained from the Bureau of Personnel Research, Carnegie Institute of Technology.

tests, were abstracted from the unpublished eighth table mentioned in Chapter 5.)

The results reveal small group differences. The following table shows the results for the two primary groups. The figures for the secondary groups are practically identical with these.

	Q_1	Q_2	Q_3
Succ. l. i. salesmen	54	65	69
Industries seniors	61	66	70

Part 4, ratio. Ratio of Normal to Speeded Writing. In Part 4 the subject is required to write the words "United States" repeatedly as quickly as he can. Sixty seconds are allowed, and the score is in terms of the number of letters written. Part 4, ratio, is obtained by dividing the number of letters written in Part 10 (normal speed) by the number of letters written in Part 4 (greatest speed.) The ratio is supposed to be an index of the subject's tendency to work at his greatest possible speed in his ordinary tasks, in other words, his freedom from load (4, p. 20).

Group differences are practically non-existent in this part. The following results are practically duplicated by the secondary groups.

	Q_1	Q_2	Q_3
Succ. l. i. salesmen	.35	.39	.43
Industries seniors	.36	.37	.43

Part 3. Speed in Checking Better Traits. In Part 3 thirty-six pairs of opposite traits are presented, as careful-careless, accurate-inaccurate, effeminate-manly, etc. The subject is required to go down the list and check the one trait in each pair which he believes is the better in most circumstances. Forty-five seconds are allowed, and the score is in terms of the number of traits checked.

Although the type of decision involved is not entirely objective, the personal element has been eliminated as far as possible. By an objective decision is meant one that is free from any reference to the reagent himself, not necessarily one that is free from internal facilitations. That the test calls for no great individual judgment is shown by the fact that the men in both primary groups agree consistently in their checks. No group differences appeared in this test, taken as a measure of social standards.

Results are given below and in the table at the end of this chapter.

	Q_1	Q_2	Q_3
Mechanical groups	25.0	30.0	34.0
Industries seniors	26.0	29.0	33.0
Misc. salesmen	18.3	23.0	29.6
Life ins. salesmen	19.4	25.4	31.2
Succ. l. i. salesmen	21.0	27.0	34.0

The second and fifth groups in the above table are the primary groups. The "mechanical groups" include the primary and secondary groups; that is, the figures for the second group above are also contained in those for the first group, but form a small proportion of that group. Similarly, the thirty successful life insurance salesmen are included with the "life insurance salesmen," forming a small proportion of that group. The Westinghouse Technical Night School seniors are omitted in giving these test results.

There is a pronounced tendency for the mechanically inclined people to show greater speed in this test than the salesmen. All men in the primary and secondary groups considered, the chances are 1 in infinity that a real difference does not exist between the mechanically inclined and the salesmen.

Part 9. Speed in Checking Personal Traits. Here the same list as in Part 3 is presented but the decision is made subjective by requiring the reagent to indicate which of each pair he himself possesses. Sixty seconds are allowed, and the score is the number of traits checked.

In this test we find that the differences between our primary groups are reversed when the secondary groups are taken into consideration. The primary sales group checks more traits than the primary mechanical group, but with all cases considered the difference is reversed and we find the mechanical groups differing significantly from the sales groups in that they check more traits.

Results are given below and at the end of this chapter.

	Q_1	Q_2	Q_3
Mechanical groups	20.7	25.5	31.5
Industries seniors	21.0	24.0	30.0
Misc. salesmen	16.6	21.5	26.5
Life ins. salesmen	16.5	21.0	26.5
Succ. l. i. salesmen	22.0	26.0	30.0

Part 6, disguises. Ability to Disguise Handwriting. The directions for Part 6 are as follows:

Write the words "United States" in the space below, trying to disguise your handwriting in as many ways as possible and as much as you can. Try out any disguise you can think of but do not print. Take as much time as you need and copy the words as many times as necessary.

Keep trying until you feel that you have made a copy that even a handwriting expert could not identify as yours.

Three minutes are allowed for this part. The score for Part 6, disguises, is the number of different successful disguises. In scoring the part, a stencil is used on which are examples of successful and unsuccessful disguises. One great difficulty with this part is the lack of an objective method of scoring. Downey calls the equivalent test in her series a test of flexibility, a term intended to cover the ability to modify one's routine activities, to dramatize, to exercise imagination (4, p. 22).

Results are given below and at the end of this chapter.

	Q_1	Q_2	Q_3
Mechanical groups	2.1	2.9	4.0
Industries seniors	1.5	2.2	2.8
Misc. salesmen	2.3	3.3	4.6
Life ins. salesmen	2.4	3.5	4.5
Succ. l. i. salesmen	2.4	3.5	4.3

The table above is presented graphically in Fig. 1. There is a

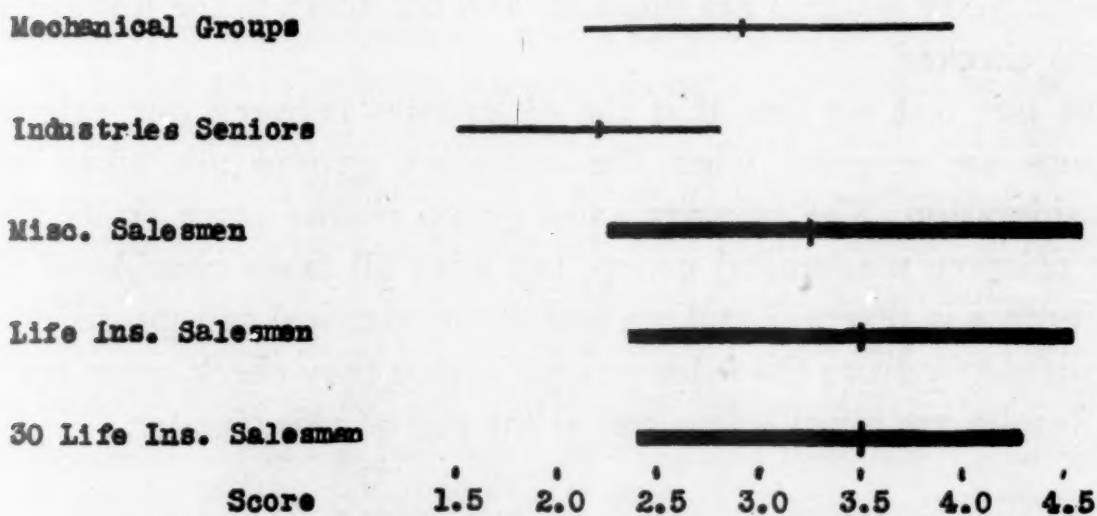


FIG. 1

Interquartile Ranges of Scores in Part 6, disguises, Test IX.
Vertical lines indicate medians

significant tendency for salesmen to excel in this sort of performance. All cases considered, the probability is 1 in 2301 that a real difference does not exist.

Part 5. Enlargement of Writing under Distraction. The page for Part 5 has a series of three numbered dots, one below the other. The subject is required to place his pencil on the first dot and write the words "United States" once while looking at the ceiling. He then repeats this with the second dot. *These two performances do not enter into any scores.* The directions with regard to the third dot are in brief as follows:

This time it will be much more difficult. Listen carefully. You are to do two things: write "United States" repeatedly and at the same time count the number of taps I make on the table. Write one phrase just below the other. Watch me while writing and counting, and when the tapping stops quit writing, and record the number of taps. Ready. Place your pencil on dot number 3.

The number of taps made is immaterial, and no record is made of the accuracy of the guesses. The taps are made about one per second, an occasional tap being skipped to avoid regularity. At the end of twenty-five seconds the tapping is stopped and the subject is told to quit writing. The performance with regard to dot 3 is then repeated farther down the page.

The score for Part 5 is the sum of two ratios. The first ratio is obtained as follows: The longest "United States" in each of the above two trials is measured in millimeters and the two lengths are averaged. This is then divided by the length in millimeters of a "United States" of average length in Part 1. The purpose of this ratio is to determine the degree to which the subject has enlarged his handwriting under distraction. The second ratio is obtained by averaging the number of letters written in each of the above two trials and dividing this average by the average number of letters written in Parts 1 and 10. This is to determine the degree to which the subject has speeded up under distraction. The sum of the two ratios is the score for Part 5 (Enlargement under distraction).

This part is supposed to distinguish between impulsiveness or

explosiveness of will as opposed to inhibition, or between the choleric and the phlegmatic temperament. Downey says of her parallel test:

"The utilization of change in size of writing under distraction of attention as an index of motor impulsion was suggested by previous work both on automatic writing and on muscle-reading. The tendency to magnify or to decrease handwriting size not only under conditions of distraction, but even with such a simple change in conditions as results from withdrawal of visual control in writing with the eyes closed is an individual characteristic of considerable significance. Extensive experiment with subjects had shown me that it was quite possible to anticipate the value of an individual as a guide in muscle-reading by his tendency to magnification of graphic movement when inhibitory checks were removed. One's value as a guide in muscle-reading is in turn significant of the degree to which one possesses the explosive in contrast to the inhibited temperament" (4, pp. 23-24).

Results are given below and at the end of this chapter. In the table below the life insurance salesmen include only those attending the School of Life Insurance Salesmanship. The remaining insurance salesmen were not given this test.

	Q ₁	Q ₂	Q ₃
Mechanical groups	1.78	2.02	2.23
Industries seniors	1.62	1.80	2.05
Misc. salesmen	1.82	2.04	2.24
Life ins. salesmen (schools only)	1.72	1.97	2.25
Succ. l. i. salesmen	1.85	2.11	2.20

A very significant tendency for the primary sales group to excel in this test (show greater impulsion) is not corroborated by the results of the secondary groups.

Part II. Assurance in Visual Memory. A large chart with the following characters on it is exposed for one and one-half minutes, with instructions to study it carefully and try to remember it.

j	IX	N
F	5	a
VI	d	8

At the end of this period the chart is withdrawn and the subjects are given time to answer the questions in Part II. The latter is in form of a true and false statement test on the characters in the chart. The following is an illustration.

1. There were eight capital letters in the chart. TRUE FALSE
The subjects are required to underline either TRUE or FALSE. If they are absolutely sure of the answer they are asked to doubly underline the word. There are fifteen such statements. The following paragraph appears after the last statement :

If you finish before time is called, you may check your accuracy in the last three statements. The word FALSE should be underlined after statements 13, 14, and 15. If you have not done this you are at liberty to change your answers.

As a matter of fact the word FALSE should be underlined only after statement 13. The score for Part 11 is in terms of the number of words doubly underlined after the statements and the effectiveness of the false suggestion made in the paragraph quoted above. If FALSE is not underlined after *both* statements 14 and 15, the score is 16, otherwise it is 0. Scores may therefore range from 0 to 31.

This is intended to be a measure of assurance or resistance to suggestion (16, p. 11). The higher the score the more assured the subject is. There is a slight tendency for the person who scores high in this test to be rated as unsociable and close-hearted.

Results are given below and at the end of this chapter. The table below is presented graphically in Fig. 2.

	Q ₁	Q ₂	Q ₃
Mechanical groups	22.5	30.8	31.5
Industries seniors	16.0	27.8	31.0
Life ins. salesmen (schools only)	12.2	15.6	28.5
Succ. l. i. salesmen	11.0	15.3	22.0

There is a very significant tendency for the mechanical groups to score higher in this test than the salesmen. All cases considered, the probability is one in infinity that a real difference between the two groups does not exist.

Part 9, ratio. Ratio of Objective to Subjective Speed of Decision. The score is the ratio of the number of traits checked in Part 3 to the number of traits checked in Part 9. This score has been treated as a measure of a self-consciousness by Ream (16, p. 11). The score in Part 9 alone would seem at first sight to be a measure of the trait, but this score must be in-

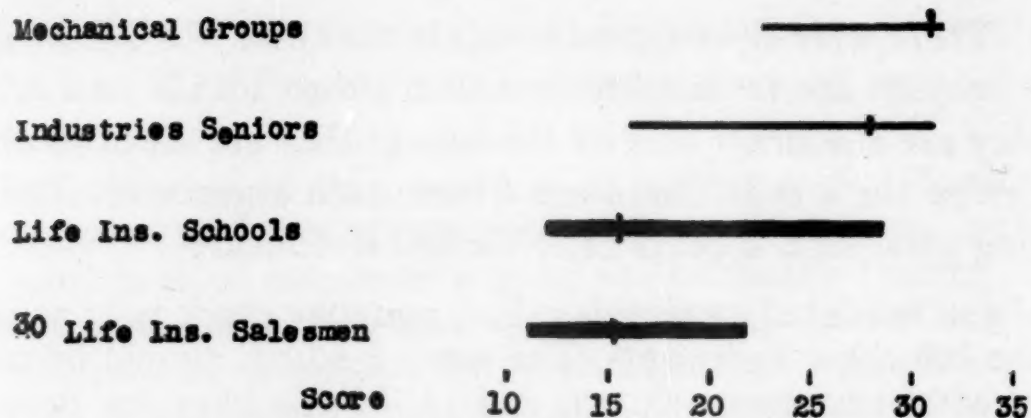


FIG. 2

Interquartile Ranges of Scores in Part II, Test IX

terpreted in the light of an objective decision. In this way we can determine the inhibiting effect of introducing the personal factor into a decision. If the ratio is low, the personal factor has not changed the situation at all and the subject may be described as free from self-consciousness. If the ratio is high, the person has hesitated about personal judgments because, hypothetically, a complex regarding himself has caused him to become embarrassed. The same mechanism works to throw into relief complex-indicators in the free association experiment. Our correlations show that the person who gets a high score in the test (and is theoretically self-conscious) is rated as lacking in self-esteem and adaptability.

Results are presented below and at the end of the chapter, and in Fig. 3.

	Q ₁	Q ₂	Q ₃
Mechanical groups	.98	1.21	1.48
Industries seniors	.96	1.19	1.36
Misc. salesmen	.80	1.05	1.38
Life ins. salesmen	.88	1.15	1.50
Succ. l. i. salesmen	.93	1.07	1.16

There is a very significant difference between the primary groups, with the mechanics students obtaining the higher ratios (more self-conscious). This difference is reduced very much with the inclusion of the secondary groups.

Part 2. Inability to Write Slowly. In Part 2 there are three groups of words, each word being followed by a blank line. In the first and second groups are five words of fifteen letters each, while the third group has eight words of ten letters each. The subject is

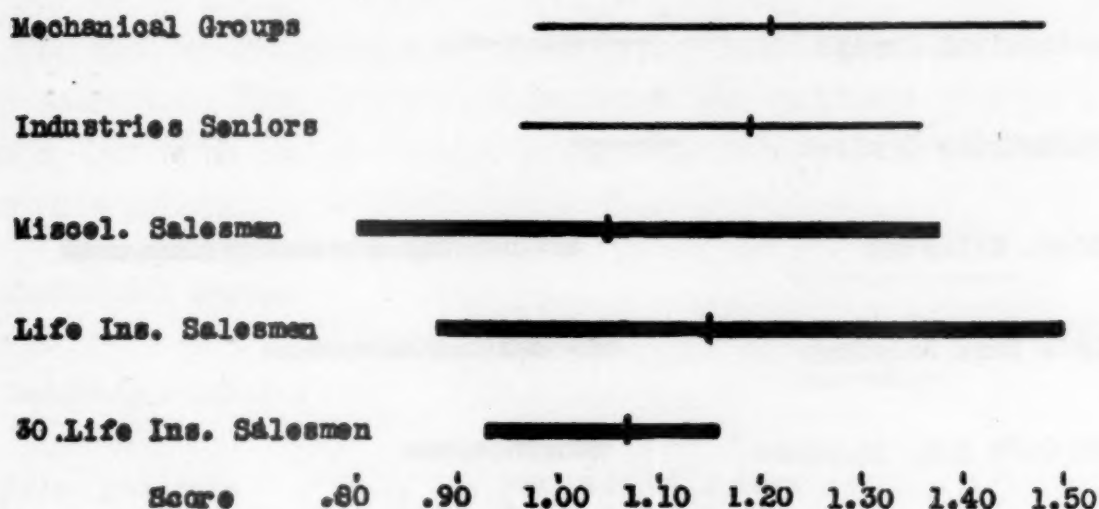


FIG. 3

Interquartile Ranges of Scores in Part 9, ratio, Test IX

required to write each word on the blank line, as slowly as he possibly can. Forty-five seconds are allowed for each of the first two parts, and sixty seconds for the third part. The directions for the three parts are similar, except that the exhortation to write slowly becomes greater. The first two groups are ignored in scoring, as they exist merely for the purpose of impressing the subject with the unusual type of performance that is demanded. The score is the number of letters written in the last section. Downey calls the equivalent test in her series a measure of "power of motor control and inhibition" (4, p. 22).

Results are presented below, at the end of the chapter, and in Fig. 4.

	Q_1	Q_2	Q_3
Mechanical groups	2.0	6.0	10.5
Industries seniors	1.0	2.0	5.2
Misc. salesmen	5.0	11.5	25.5
Life ins. salesmen	3.5	7.3	17.5
Succ. l. i. salesmen	4.0	8.4	12.0

A very significant tendency exists for the mechanical groups to write more slowly in this test.

Part 8. Speed of Writing in Small Space. Part 8 consists of six short sentences (18 to 36 letters), each of which is followed by a line with vertical bars at its ends. In each case the line is shorter than the printed sentence. The directions are as follows:

Copy each of the sentences below *as rapidly as possible* on the

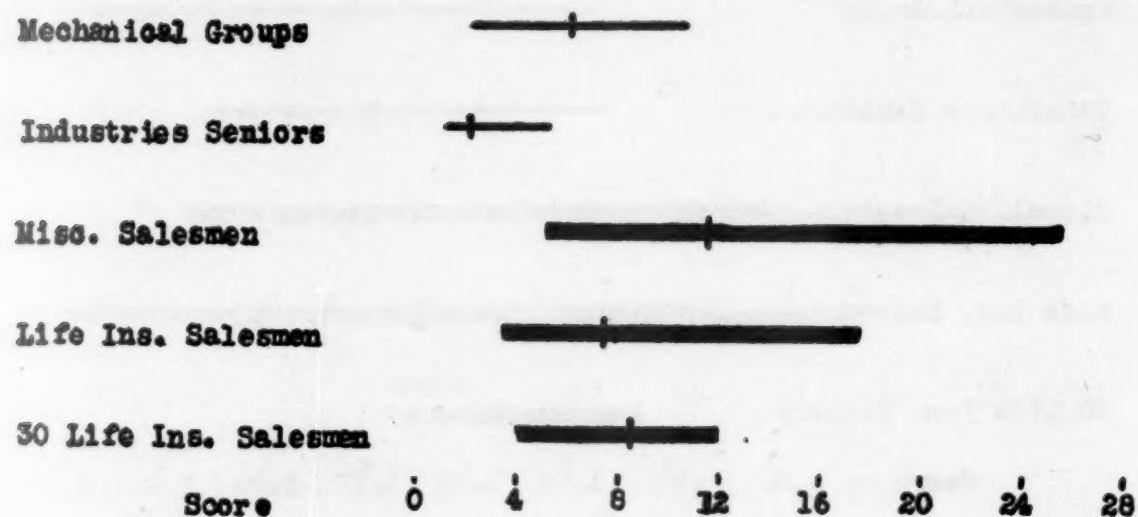


FIG. 4

Interquartile Ranges of Scores in Part 2, Test IX

line after each sentence. Be careful not to let the writing extend beyond the end of the line.

Forty-five seconds are allowed.

The score is the total number of letters written on the lines. Letters which extend beyond the bars at the ends of the lines are not counted. Downey says regarding the equivalent test in her series:

"This test impresses a double mental set, namely, adjusting one's movements to a limited space and doing it as rapidly as possible. . . . Just what such ability to coordinate impulses indicates is something of a question. My study of the individuals who make particularly good records or who fail overwhelmingly suggests that it serves as an index to what is called 'keeping one's head'; 'presence of mind'; perhaps orderly handling of a complex situation without previous practice" (4, pp. 18-19).

To the writer it seems that the test measures merely a skilled coordination such as is required in certain of the finer mechanical operations. This view is strengthened by the fact that the two highest correlations of this test with ratings are $+.37$ with accuracy in work and $+.40$ with quickness in work.

Results are given below, at the end of the chapter, and in Fig. 5.

	Q ₁	Q ₂	Q ₃
Mechanical groups	83	93	105
Industries seniors	82.5	92.5	97
Misc. salesmen	54	68	83
Life ins. salesmen	63	75	90
Succ. l. i. salesmen	75	85	95

The mechanical groups do much better in this sort of task than the salesmen. The differences between the primary groups are small, but with the secondary groups considered, the differences are very significant.

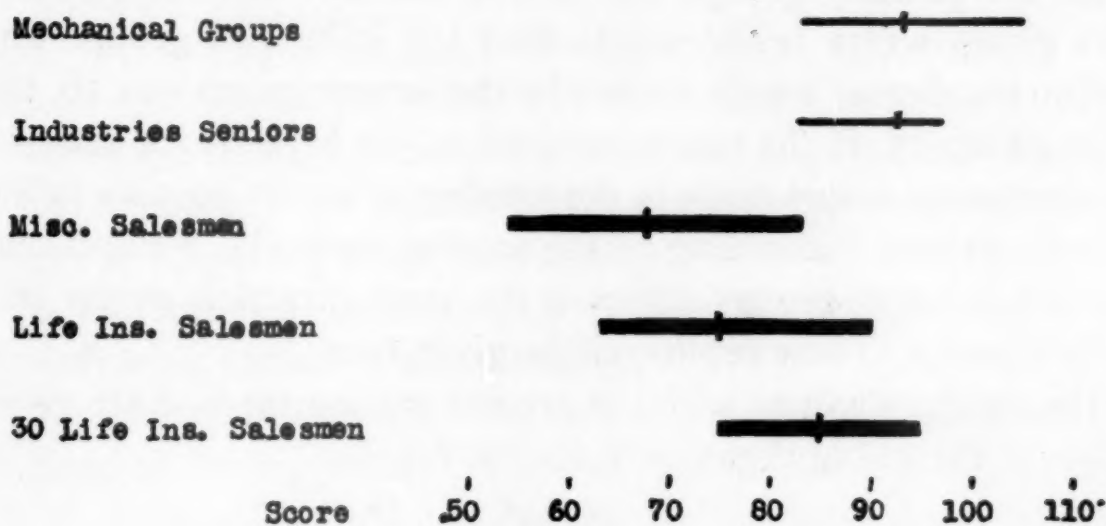


FIG. 5

Interquartile Ranges of Scores in Part 8, Test IX

*Part 7. Carelessness in Copying.*⁸ This part consists of three handwritten sentences (fourteen letters each), written by different persons. The instructions are to copy the sentences as exactly as possible. Space for this purpose is provided between the sentences. One minute and a half are allowed for this part. The score is in terms of the number of divergences from the originals in such details as dotting i's, preserving the correct slant, closing the loops of a's, etc. The subject is scored only on the first two sentences, and in each of these fifteen mistakes are possible, in other words, there are fifteen details in each of these two sentences which are observed for purposes of detecting mistakes. A stencil is used in scoring which is laid over the test and has arrows which point to these details, enabling the scorer to observe rapidly in each sentence how many of these fifteen standard details have been overlooked in copying the sentence. As in Part 6, disguises, the scoring method is weak in that it is quite subjective. One error in the administration of this test is the fact that speed is not taken into ac-

⁸ Although it does not concern this study directly, it is worth while noting that when standings are plotted, as on the first page of the test booklet, high decile standings accompany high numerical scores, except in Part 9, ratio, Part 2, and Part 7, where the reverse is true.

count. It was presumed that everyone would finish the first two sentences in the time allotted, but this did not prove to be the case. In the results given below, the difference between the primary groups is reversed with the secondary groups. The difference between the primary groups was due to the fact that the primary sales group wrote fewer words than the industries group. The median number of words written by the former group was 16, the latter group 25. If the test is rescored on the basis of the ratio of the number of errors made to the number of errors possible in the amount written (according to the scoring method), we find that the two primary groups differ in the same direction as the secondary groups. These results will be given later.

The results obtained with the present scoring method are given below, at the end of the chapter, and in Fig. 6.

	Q_1	Q_2	Q_3
Mechanical groups	3.0	5.0	9.0
Industries seniors	2.3	2.9	4.5
Misc. salesmen	6.0	9.0	13.0
Life ins. salesmen	4.6	9.0	14.0
Succ. l. i. salesmen	1.3	2.8	4.7

The differences between the mechanical groups and the salesmen are very significant, and indicate that the salesmen show less care for detail in such work than the mechanical groups.

Part 6, letters. Number of Disguises Attempted. The score is the number of letters written in Part 6. The equivalent test in the original Downey series is called a test of tenacity or perseverance.

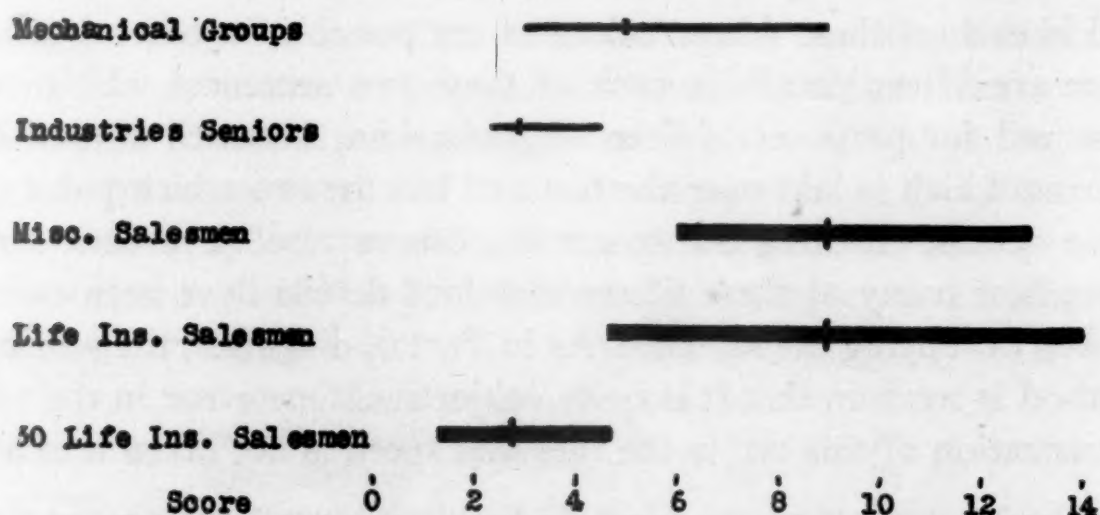


FIG. 6

Interquartile Ranges of Scores in Part 7, Test IX

The test involves persistence in attempting an indefinite task. Results are given below and at the end of the chapter.

	Q_1	Q_2	Q_3
Mechanical groups	76	91	111.5
Industries seniors	65	83	105
Misc. salesmen	76	100	130
Life ins. salesmen	68	90	120
Succ. l. i. salesmen	78	102.5	128

There are no important group differences in this test. There is a slight tendency for salesmen to make a greater number of attempts at disguising their handwriting.

In addition to the scores regularly obtained from the test series, the following measures were obtained.

Agreements Between Checks in Parts 3 and 9. This score was obtained at the suggestion of L. D. Anderson, as a possible measure of conceit. The score is the number of agreements between the traits checked in the first column of Part 3 and the first column of Part 9. In Part 3 we have the opinion of the reagent on the most desirable traits to possess; in Part 9 he indicates which of these desirable traits he himself possesses. The number of agreements shows how desirable he considers his own traits.

Results obtained with the primary groups are given below.

	Q_1	Q_2	Q_3
Industries seniors	12.7	15.0	15.8
Succ. l. i. salesmen	12.5	13.8	16.0

The mechanical group shows a slightly greater number of agreements than the sales group.

Traits Checked in Part 3. Group comparisons were made in the frequencies with which the different traits in Part 3 were checked. No important differences were found, the great majority checking the traits in the socially acceptable way. This is added proof of the objectivity of the decision made in the test.

Traits Checked in Part 9. Similarly, group comparisons were made in the frequencies with which each trait in Part 9 was checked. While not to be accepted as a self-rating, it is often the case that under stress of time and under test conditions a person will give a truer estimate of himself than he would if he had time to reflect and rationalize. No startling differences were discovered, the greatest ones being the following: 8 of the primary sales group checked

"slow," whereas 17 of the primary mechanical group checked that trait; 18 salesmen and 12 industries students checked "quick"; 9 salesmen and 1 industries student checked "cowardly"; 17 salesmen and 27 industries students checked "brave."

Part 4. Speeded Writing. Scores were in terms of the number of letters written in Part 4. This is a measure of the subject's greatest speed of writing. It is more or less a measure of coordination of impulses. The following results were obtained with the primary groups.

	Q_1	Q_2	Q_3
Industries seniors	149	169	187
Succ. l. i. salesmen	151	163	175

> The industries students show a slight superiority in speeded writing.

Part 7. Revised Scoring. This part was rescored for reasons previously given. The revised scoring method is to obtain the ratio of the number of errors made to the number of possible errors by our scoring method, in the amount written. It leaves out of consideration the third sentence, but very few work on it. Results are as follows for the primary groups.

	Q_1	Q_2	Q_3
Industries seniors	.17	.24	.33
Succ. l. i. salesmen	.14	.25	.30

This reverses the differences found when Part 7 is scored in the customary manner. The difference is slight, with the salesmen exhibiting a greater tendency toward making errors.

DIRECTED ASSOCIATION TEST

This test was printed on two sheets, the first containing the directions and the second containing the body of the test. The first page is reproduced herewith.

DIRECTED ASSOCIATION TEST

EXAMPLE:

Column I	1st Solution	2nd Solution
NAIL	NAIL	NAIL
	hammer	rust
	handle	
	wood	
	tree	
	roots	
	damp	
WATER	WATER	WATER

EXPLANATION:

Note that in Column I there is no direct relationship between "NAIL" and "WATER." You are to write words in the blank space in the column so that a continuous association is formed from "NAIL" to "WATER." The example has been worked for you in two ways. Look at the first solution. Here "NAIL" suggests hammer," "hammer" suggests "handle," and so forth, "damp" finally suggesting "WATER." Thus a continuous association is formed from "NAIL" to "WATER," each word being suggested by the preceding one. The same thing is done in the second solution, but with only one word.

On the following page you will find ten columns such as Column I. In each column you are to form a continuous association from the first to the last word.

No stated number of words is required in each list, but make your lists as brief as possible. Work rapidly.

Do not turn page until told to do so.

The first and last words in the ten columns were as follows: sun-faith, day-blotter, potato-cement, sky-fever, inch-black, journey-guilty, rifle-square, fun-question, sound-habit, copper-ignorant.

In giving this test the directions and examples on the first page were read aloud to the subjects and any questions answered. Then three minutes of continuous work were allowed on the test. The scores used in comparing the groups were: (1) the number of words per column, and (2) the number of columns completed. The character of the words written and the closeness of their association were ignored in scoring the test, as being impossible of simple and objective measurement. Group comparisons were not made by columns.

This test was devised and used in the present study under the assumption that it measures ability in directed thinking. The person before whom the test is placed is required to direct his thought processes toward a definite end, and in order to receive a high score must keep his attention continually fixed on that end. It is easily imaginable that a person given to phantasy building, whose thinking, in other words, is not directed toward serviceable ends, will lose his moorings at the first word and float away on a tide of words with no port in view. This type would be represented by those who on the average supply long lists of words and who also take plenty of time in completing the test. At the other extreme we should find the individual who is always present-minded and who

directs his thinking toward definite objective ends. Such a person will get a high score in the test, *i.e.*, he will write few words and finish most of the lists. The two types are represented in the two solutions on the first page of the test.

The number of words per column correlates $+.28$ with ratings on present-mindedness. The number of columns completed shows the extraordinary correlations of $+.54$ with ratings on self-assertion and $+.64$ with ratings on bearing.

The following results were obtained with the primary groups and the Case School seniors in Mechanical Engineering.

Numbers of words per column :

	Q_1	Q_2	Q_3
Industries seniors	1.60	2.25	3.05
Mech. Eng. seniors	2.02	2.43	2.75
Succ. l. i. salesmen	1.85	2.37	2.95

Number of columns completed :

	Q_1	Q_2	Q_3
Industries seniors	3.7	5.4	7.0
Mech. Eng. seniors	6.0	7.4	8.0
Succ. l. i. salesmen	5.0	6.7	8.8

In each case the engineering students obtain the highest median score and the industries students the lowest. Since the salesmen occupy an intermediate position it is difficult to interpret the results. If we ignore the engineering students, we note that the salesmen excel in speed of association, but that the industries students excel in directness and brevity of association.

SERIES 12. KENT-ROSANOFF FREE ASSOCIATION TEST

In its original form, as developed by Kent and Rosanoff (11) this test consisted of one hundred words which were presented orally to the subject one at a time. The subject responded in each instance with the first word which came to his mind, the response being recorded by the examiner. The test was in no sense a group test. The speed of response was at first recorded, but was later ignored owing to the magnitude of their undertaking.

The originators of the test aimed to make a study of "certain disorders of the flow of utterance which appear to be dependent upon a derangement of the psychical processes commonly termed association of ideas" by "an application of the experimental meth-

od known as the association test" (11, p. 5). In order to have on record the responses of normal people so that these could be compared with the responses of the insane, the association list which they arranged was given to one thousand normal subjects. From an analysis of this material the authors are led to observe that "the one tendency which appears to be almost universal among normal persons is the tendency to give in response to any stimulus word one or another of a small group of common reactions" (11, p. 14). The tendency among the insane is to give unique responses, but it is conceivable that an original person of great ability may give uncommon responses.

The possibilities of this test in the study of vocational differences has been scarcely recognized. Since Kent and Rosanoff standardized the test in 1910, little use has been made of it on normal adults. Wells and others have given us classifications of the types of responses, and Murphy has used it to some extent for the comparison of people who are inclined toward literature with those who are inclined toward science. Most of those who have used the test were drawn to it by an interest in abnormal psychology. Its application to normal adults as a measure of various volitional and associational tendencies, rather than as a means of detecting insanity or complexes, has been passed over.

The Bureau of Personnel Research has adapted this test for its use by printing the list and administering it as a group test, without any very apparent change in the function measured. No changes were made in the lists of words. The words are printed consecutively with blank spaces opposite them in which the reagents write their responses. The directions and examples are read to the reagents by the examiner and any questions regarding them are answered. A starting signal is given, at which the subjects commence to record their responses to the words in sequence, and at the expiration of four minutes a stopping signal is given. This form is far easier to administer than the individual test, and reintroduces the factor of speed. The error of timing is reduced, since it can enter only into the first and last responses given by the subject. We have only a measure of average time per word, instead of a separate measure for each word. Speed of writing is a factor

which enters into the score on the number of responses given. The correlation of Speeded Writing (Part 4 of Test IX) with the number of responses in the Kent-Rosanoff Test is $+.37$.

Following are the directions for the test:

Below is a list of 100 words. Write after each word the first word it suggests (the first word that comes to your mind).

Do not write sentences.

Do not stop to think.

Work as quickly as you can.

EXAMPLES:

cowmilk

grassgreen

schoolteacher

1. table

2. dark

etc.

For the purpose of this study, this test has been scored in thirteen different ways, each of which is described below together with its results.

Number of Responses. This score is simply the number of word responses given by the subject. General intelligence is probably the dominant factor in this performance. In this connection Wells says:

"Probably no one could seriously assert that increased emotional reaction is the sole cause of lengthened association time, though it need not be questioned that it is an important contributing cause. The principal other factors are the failure to find a response that is intellectually satisfying, and a failure of predominance of any one among the associations presented" (23, p. 20).

We might very well assert that these factors are inversely correlated with intelligence. Speed of writing and general intelligence are the two tested functions which correlate most highly with the number of responses. The correlation coefficients are respectively $+.37$ and $+.31$.

The interquartile ranges for the two primary groups are given below. The figures are practically identical for the two groups.

	Q_1	Q_2	Q_3
Industries seniors	50	62	70
Succ. l. i. salesmen	55	62	70

Number of Spaces Omitted. The score was the number of spaces

omitted up to the last word response given. Blocking of response is an extreme result of the factors operating to increase reaction time. Results for the primary groups are given below.

	Q_1	Q_2	Q_3
Industries seniors	.4	.9	2.3
Succ. l. i. salesmen	.3	.8	1.4

There is a very slight tendency for the industries students to omit more responses.

Coefficient of Commonality. The commonality score on a response is obtained by referring to the Kent-Rosanoff tables of responses given by one thousand normal adults (11, p. 77). In these tables each response word is preceded by a number which represents the number of individuals (out of the thousand) who gave that response to the particular stimulus word. For example, after the stimulus word "dark" we find appearing first the word "afraid," with the figure 6 before it, indicating that six of the one thousand subjects gave the word "afraid" in response to the word "dark." In scoring any person's test paper, we give him a score of 6 if he writes the word "afraid" after the stimulus word "dark." The score used in this study is the sum of the commonality scores of the first twenty-five responses given by the subject.

This score is a criterion of the extent to which a person's thoughts run in normal objective channels (24, p. 74). Responses with low commonality value are unique responses which usually refer to the subject's individual experience. We cannot, however, go so far as to say that a person who scores low has psychopathic tendencies, since unusual responses may be characteristic of a very original person. The genius and the imbecile may find a common ground in their commonality score.

Results obtained with the primary groups are given below.

	Q_1	Q_2	Q_3
Industries seniors	1600	2100	3400
Succ. l. i. salesmen	2300	3500	4400

The sales group shows a very significant superiority in this function.

Responses with Commonality Value of Zero. This score is the number of responses entering into the preceding score whose com-

monality value is zero, *i.e.*, the number of words which were not found in the Kent-Rosanoff tables.

Results obtained are as follows:

	Q_1	Q_2	Q_3
Industries seniors	1.6	3.1	4.5
Succ. l. i. salesmen	.7	1.5	2.6

As a corollary of the results of the preceding scoring method we find the industries students obtaining higher scores in the number of zero value responses.

Responses with Commonality Value of 1-5 Inclusive. These responses are slightly less unique than the preceding ones. Scores are based on the first twenty-five responses given by the subjects.

	Q_1	Q_2	Q_3
Industries seniors	2.8	4.0	6.0
Succ. l. i. salesmen	1.7	2.9	4.8

Here again we find industries students obtaining higher scores.

Five additional scores were obtained, using the classification given by Wells (22, 24). Effort toward the classification of types of responses arose among psychiatrists. Some of the better known classifications are those of Wells, Murphy, Kräpelin, Aschaffenburg, Münsterberg, Claparède, etc. Most of the classifications are detailed and more logical than psychological, and they offer great obstacles to practical use. Wells' classification seems to possess more points of merit than the others, and was therefore chosen for use in this study. His classification is given on the following page. This extract is copied verbatim from "Association Tests" (24, p. 77).

1. The egocentric reactions may be typified by—

a. Predicate reactions. Cloud-ominous, flower-pretty, crooked-line, red-rose, scratch-cat, lion-roar, money-wish, invent-machine, weasel-stealth, beauty-rose, safe-quite, almost-grown, sing-well, never-decide, nicely-very (including the responses yes and no).

b. Responses in the form of proper names. Citizen-New York, boy-Johnny, mountain-Kearsarge.

c. Reactions interpreting the stimulus word as a proper name. Eagle-newspaper, park-square.

d. Reaction involving the response of a pronoun. Hand-you, health-me.

e. Interjections, failures of response or repetitions of the stimulus word.

2. The supraordinate category is confined strictly to the individual-genus order, defined in such examples as, priest-man, potato-vegetable, lily-flower, cow-animal.

3. The contrast group is composed, of course, of reactions in which the response means the opposite of the stimulus and is made up of such associations as, good-bad, trouble-pleasure, scatter-gather, fertile-sterile, and the like.

4. The miscellaneous category is composed essentially of the remaining reactions of the "inner" type. It includes about 45 percent of all associations.

5. The speech-habit group is composed of associations by familiar phrase (stand-pat) word compounding (play-ground) simple sound associations (tease-sneeze) and syntactic changes (high-height).

The purpose of a classification of this sort is to gain an insight into some of the mental processes.

The only modification made in the use of this classification was to substitute the word "subjective" for "egocentric" in naming the first category, in order to avoid the connotations of the latter word. The responses falling into this group are not egocentric in the sense that they disclose a self-centered personality, but in the sense that they are not objective or universal.

The scores for each of the five categories consist of the number of responses belonging to that category out of the first twenty-five words in the list; not necessarily the first twenty-five responses made by the subject, since omissions of response are classified as subjective responses.

Some difficulty was encountered in using this classification since a great many words could fit with equal justification into several of the classes.

Subjective Responses. The following results were obtained with the primary groups.

	Q_1	Q_2	Q_3
Industries seniors	5.5	11.0	16.3
Succ. l. i. salesmen	3.0	8.0	12.0

In view of the fact that subjective responses have low commonality value, we should expect these results.

Supraordinate Responses. Very few responses of this type occurred. Twenty-one of the industries students and twenty-six of the salesmen made no responses of this type.

Contrast Responses. Since this has proved to be the most important single score yielded by the test, it deserves special attention. It correlates $+.92$ and $+.98$ with the coefficient of commonality, and since it is a much easier score to obtain than the commonality score (a matter of several seconds compared with over a minute)

it may be very easily substituted for that score. It also correlates $-.90$ and $-.86$ with the number of subjective items, another important score which is difficult to obtain. It yields fairly high correlations with most of the other scores obtained from this test, and consequently is the most significant and representative score yielded by the test.

All of the groups were scored on the number of contrast responses. Results are given below and in Fig. 7.

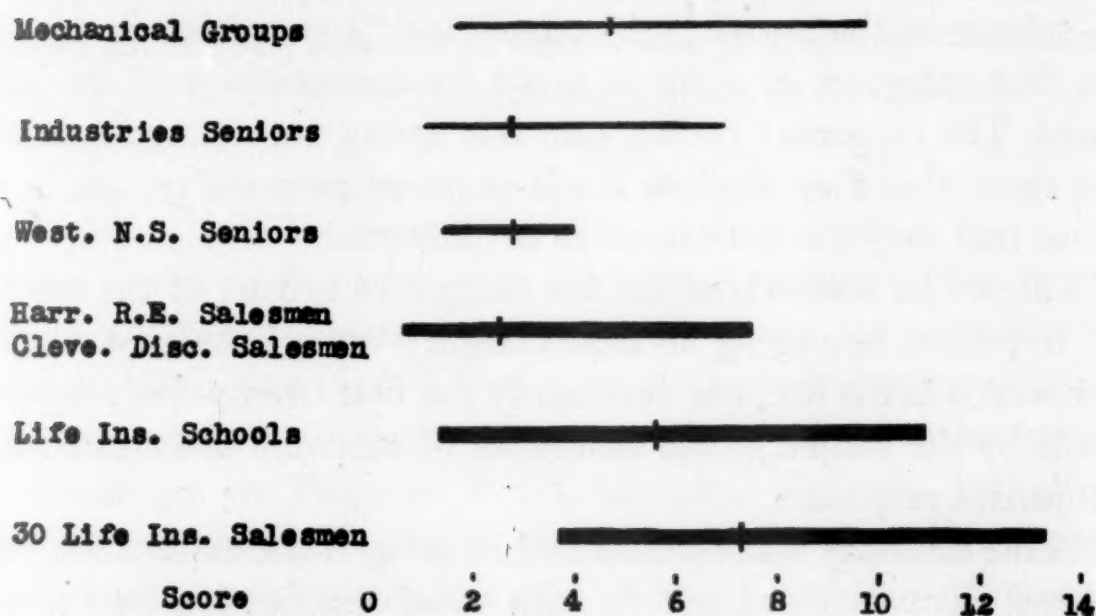


FIG. 7

Interquartile Ranges of Number of Contrast Responses,
Series 12, Kent-Rosanoff Test

	Q ₁	Q ₂	Q ₃
Mechanical groups	1.6	4.7	9.8
Industries seniors	1.0	2.7	7.0
West. N.S. seniors	1.4	2.8	4.0
Cl. Disc. Co. and Harr R.E. Co. salesmen	.6	2.5	7.5
Life ins. salesmen (schools only)	1.3	7.6	11.0
Succ. l. i. salesmen	3.7	7.3	13.3

The large difference between the primary groups is cut down considerably by the secondary groups, yet we find the life insurance salesmen showing a slight superiority as a whole over the mechanics students. (See table at end of chapter.)

Miscellaneous Responses. The following results were obtained on the primary groups.

	Q ₁	Q ₂	Q ₃
Industries seniors	7.0	10.0	12.6
Succ. l. i. salesmen	8.0	9.9	10.9

No group differences appear.

Speech-Habit Responses. Results obtained with the two primary groups are given below.

	Q ₁	Q ₂	Q ₃
Industries seniors	.4	.8	1.6
Succ. l. i. salesmen	.6	1.4	2.0

There is a significant tendency for salesmen to make more responses of this nature than industries students.

Responses were also classified into three grammatical categories.

Noun Responses. Results on the primary groups follow.

	Q ₁	Q ₂	Q ₃
Industries seniors	12	15	19
Succ. l. i. salesmen	12.5	14	18.5

No group differences appear.

Adjective and Adverb Responses:

	Q ₁	Q ₂	Q ₃
Industries seniors	5.0	6.8	9.8
Succ. l. i. salesmen	6.0	9.1	10.5

The salesmen show a significant tendency to give more responses of this class than the industries students. The difference is not as great as in the number of contrast responses.

Verb and Participle Responses:

	Q ₁	Q ₂	Q ₃
Industries seniors	2.3	3.3	4.3
Succ. l. i. salesmen	1.0	2.8	3.9

There is some tendency for industries students to make more responses of this sort than the salesmen.

SUMMARY

The results which may be classified as highly significant from the statistical standpoint are the following:

Mechanically inclined people excel in

Speed of checking better traits (Part 3, Test IX)

Speed of checking personal traits (Part 9, Test IX)

Assurance in visual memory (Part 11, Test IX)

Speed of writing in small space (Part 8, Test IX)

Number of subjective responses in the Kent-Rosanoff test.

Salesmen excel in

- Ability to disguise handwriting (Part 6, disguises, Test IX)
- Inability to write slowly (Part 2, Test IX)
- Carelessness in copying (Part 7, Test IX)
- The coefficient of commonality in the Kent-Rosanoff test.

The following are less significant results:

Mechanically inclined people excel in

- Enlargement of writing under distraction (Part 5, Test IX).
- Ratio of objective to subjective speed of decision (Part 9, ratio, Test IX)
- Agreements between checks in Parts 3 and 9.
- Speeded writing (Part 4, Test IX)

Salesmen excel in

- Number of disguises attempted (Part 6, letters, Test IX)
- Speech-habit responses in the Kent-Rosanoff test.
- Contrast responses in the Kent-Rosanoff test.

SUPPLEMENTARY NOTE

The following table gives a more accurate estimate of the tested differences than is afforded by comparisons of interquartile ranges. The figures show how significant are the differences in means between the Mechanical Group and the Miscellaneous Salesmen and the Life Insurance Salesmen combined, in those tests in which results on these large groups are available. In Part 3 of Test IX, for instance, the group referred to as the Mechanical Group is compared with the Miscellaneous Salesmen and the Life Insurance Salesmen combined. Differences between the primary groups have not been treated in this manner since the procedure has no value with small groups. The statistical treatment follows that of Fernald, Hayes, and Dawley (5, p. 109 et seq.)

TABLE I

TEST	AVERAGES		DIFFERENCE		
	SALES GROUPS	MECH. GROUP			
Test IX					
Part 3	24.34	28.44	4.10	6.30	Infinity
Part 9	21.63	25.66	4.03	4.74	555,556.0
Part 6, disg.	3.00	2.60	.40	3.33	2,301.0
Part 5	197.98	201.64	3.66	1.16	8.1
Part 11	17.10	25.59	8.49	8.40	Infinity
Part 9, ratio	122.00	125.76	3.76	.885	5.3
Part 2	14.18	9.00	5.18	3.98	31,546.0
Part 8	73.62	94.73	21.11	9.22	Infinity
Part 7	9.68	6.75	2.93	6.42	Infinity
Part 6, letters	103.58	101.76	1.82	.498	3.2
Kent-Ros. Test					
Cont. Resp.	5.34	5.08	.26	.52	3.3

CHAPTER III

GROUP COMPARISONS BASED ON ANSWERS TO QUESTIONNAIRES

THE METHOD

Questionnaires have been used for gathering data in diverse experiments by many psychologists, including Galton, Hall, Leuba, and others. The questionnaire method is objective and has the advantages that no timing is necessary and groups do not have to be assembled for purposes of administering the papers. For the same reasons, however, a certain caution must be observed. If the purpose of the questionnaire is obvious there is nothing to prevent the subject from filling it out in the way which he thinks will best serve his interests. In order to make the answers more valuable, the purpose of the questionnaire must not be too apparent. If under these circumstances the subject guesses at the purpose and fills out the questionnaire falsely, he runs no greater chance of hitting upon the "right" answers than he would in a test.

In this study a series of five detailed questionnaires was submitted to the two primary groups and to the Case School seniors. Group comparisons were made in answers given. By this means it was intended to study differences in personality as expressed in interests and attitudes, and to determine the importance of personal history as a cause for any differences in personality disclosed.

No statistical evaluation of the differences was made, owing to the immense amount of computation involved. In the presentation of the results, the original figures are given in most instances.

DESCRIPTION OF QUESTIONNAIRES

The subject matter of the five questionnaires is roughly the following: Questionnaire 1, early personal history; Questionnaire 2, vocational interests; Questionnaire 3, avocational interests; Questionnaire 4, likes and dislikes; Questionnaire 5, beliefs. The

groundwork of the lists was a series of questions submitted to C. S. Yoakum by students enrolled in a seminar in personnel research in 1919, at Carnegie Institute of Technology. These questions were intended to reveal a cross-section of an individual's personal history and interests at several important stages of his development. It is due to the incentive furnished by Yoakum that the series of questions was compiled and that modified forms were used in this study. In addition to this source, items were drawn from the published material of the following men: Allport, Baade, Lipman, and Stern, Cimbale, Healy, Hoch and Amsden, Meyer, Moore, Pressey, Sommer, Stern, Wells, and Woodworth. A number of forms in use at various institutions were also consulted. Items for the questionnaire on beliefs were contributed by M. A. Bills and L. D. Anderson, of the staff of the Bureau of Personnel Research. Some use was made of the lists given by Kemble, Nathan and Mencken, and Sumner.

Questionnaire 1. Early Personal History. The personality of an individual is the resultant partly of heredity and partly of environment. The latter commences its modifying influence directly after birth, and during childhood so molds the individual that the impressions of this period have more influence in shaping his personality than those of any later period. By finding out what these impressions were, we can better understand the personality of the adult. In our case we can determine to what extent the individuals in the same vocational group were subjected to the same influence in childhood.

The most thorough attempts to determine the effect of environment in shaping the adult personality have come from psychiatrists. Before attempting to cure his patient the psychiatrist makes it a point to have before him all the material he can assemble on the past history of the patient. He can then trace the causes of the malady and apply such curative methods as the case demands.

That personal history is an important factor in vocational choice and success has been proved by Andrews (1), Goldsmith (8), and Ream (17). These workers have found that certain facts yielded by questions ordinarily included in application blanks have such great vocational differentiating value that workers may with fair

success be chosen merely on the basis of their answers to these questions. Their results have been carried over into this study on a larger scale.

Questionnaire 1 consists of seventy questions covering parentage, and early home and social environment, etc., up to the approximate age of twelve.

Questionnaire 2, Vocational Interests. Questionnaire 3, Avocational Interests. Questionnaire 4, Likes and Dislikes.

Questionnaire 2 covers items of vocational interest. The third page is a modification and enlargement of a form used by Moore (13) for determining occupational interests. The 72 occupations are listed in alphabetical order, but they are readily classified into general groups, such as scientific occupations, literary occupations, selling, indoor work, outdoor work, executive work, etc.

Questionnaire 3 covers such items as hobbies, literary interests, diversions, athletic interests, social tendencies, religious tendencies, etc.

Questionnaire 4 contains 129 items toward which the subject expresses his attitude, and which fall into three general groups: first, a series of physical attributes of people, up to item 26; second, a series of mental attributes of people, items 27 to 76; and third, a series of miscellaneous items, 77 to the end. In addition to the detailed tabulation of the answers given by groups of individuals, this questionnaire offers information on personality in the total number of each kind of symbol checked in response to the first 76 items. Correlations with ratings (Chapter V) show that the person who tends to check a great many "?" after the first 76 items tends also to be rated as flexible and adaptable ($r = +.48$). The person who checks a great many L's and L!'s after these items tends to be rated as submissive ($r = +.43$), self-conscious ($r = +.43$), and unadaptable ($r = +.31$). Group comparisons on the basis of the number of such symbols checked reveal no differences.

An individual may go into an occupation not only because of certain factors in his personal history or because of an interest in that occupation, but also for the reason that he has a number of concomitant interests which are gratified by the type of work he

has elected to enter upon. In addition to sales ability or abilities, which may be difficult to fathom, successful salesmanship is due to communities of interests all of which find an outlet in sales tasks; such interests, for example, as in talking to and meeting people, in variety in daily work, in walking around rather than sitting at a bench all day, and so on. It has been shown that records of such interests are valuable supplements to tests for the selection of salesmen.

It does not matter much for present purposes how we define interests. In behavioristic terms, interest in an object may be defined as a tendency to make positive reactions toward that object. Introspection would add the affective element, or "likes." We are not concerned here with interests that are mere reflexes, such as the interest in a bright light in the periphery of vision. Rather we are concerned with those which are developed in a social environment and are based on either heredity or social habit.

Very little scientific study of interests has been made up to the present. The outstanding researches are those which Thorndike (19) has carried out on interests in school studies. The methods used were such as to make the results of limited significance. They point to the conclusion that courses tend to maintain their relative degree of interest throughout school or collegiate life; that a high correlation exists between a person's interest in a school subject and his ability in that subject as judged by himself; and that a significant, but somewhat lower, correlation exists between interest in a subject and ability in it as measured by school grades. The conclusions give weight to any arguments for the use of interests as auxiliaries to measures of abilities.

The analysis of interests has played a prominent part in two major studies produced by members of the staff of the Bureau of Personnel Research. Moore (13) used an interest questionnaire in differentiating among a group of graduate engineers those who inclined toward design engineering and those who inclined toward sales engineering. The section of his interest questionnaire which proved to be the most reliable for the differentiation of the two groups was a record of occupational preferences. A scoring method for this blank was determined empirically; that is, if a

larger proportion of the sales engineers than the design engineers liked a certain occupation, this reaction to the occupation was assigned a score favorable to sales engineering. The total score for any person indicated whether his inclinations were in the direction of design engineering or sales engineering. No attempt was made to determine the relative significance of the items entering into the total score, all such items being weighted one. By means of the total score on choice of occupations, 82 per cent of the men were placed properly, in other words, with the most favorable critical score, there was an overlapping of only 18 per cent.

Ream (17) used interest blanks very much like Questionnaires 2 and 4 of the present series, in his study of methods of selecting successful life insurance salesmen. In his study a refinement of statistical procedure was introduced, namely, where the proportions of successful and unsuccessful salesmen who liked or disliked an item differed considerably, the ratio of the difference in proportion to its standard error was calculated. All items in which this ratio was one or more entered into the total score on the interest blanks. All items were weighted one. Distributions of total scores on the interest blanks showed that by their means approximately 80 per cent of the men were placed correctly.

Any attitude which has a strong emotional accompaniment may be called a "complex." Thus Hart (*Psychology of Insanity*) speaks of the photography complex. Pressey has tried to measure the complexes of an individual by the questionnaire method (15). His contribution presents two aspects of interest: (1) the blank is made extremely concise and compact by printing lists of words with directions for expressing one's attitude toward them at the top of the page, each word thus representing what would ordinarily be a complete question; (2) a method is given for obtaining a total score. Pressey selected for his total score ten items crossed out in greater proportion by successes in school and ten others crossed out in greater proportion by failures. By subtracting each of the latter from the former (checked by any student) he obtained a total score which differentiated successes from failures. The overlapping of the distributions for the two groups, using the most favorable critical score, was only 10 per cent (11/106).

Questionnaire 4 serves a somewhat similar purpose. Complexes are here disclosed by checking L! or D! These checks are due to emotionally toned incidents in the previous experience of the reagent by which the object of the complex acquired a favorable or unfavorable halo.

✓ *Questionnaire 5. Beliefs.* The final questionnaire consists of a number of questions on which people tend to disagree. The answers are therefore measures of attitudes, perhaps emotionally toned, and in a limited sense serve to gauge the subject's information.

✓ That attitudes expressed in answers to such questions are of vocational importance, is shown by one study at least, that of Leuba (12, p. 255) on the belief in God and immortality. He compared leaders and lesser men in the physical and biological sciences in the proportion of their numbers believing in God and immortality. The proportions are as follows:

		PER CENT BELIEVING IN	
		GOD	IMMORT.
Physical sciences	Leaders	34.8	40.0
	Lesser men	49.7	57.1
Biol. sciences	Leaders	16.9	25.4
	Lesser men	39.1	45.1

✓ These figures have no direct bearing on the present study except as they show the possibility of obtaining important group differences in reactions to moot questions.

The headings of the various questionnaires and specimen questions are given on the following pages.

QUESTIONNAIRE 1

EARLY PERSONAL HISTORY

This information is wanted for statistical purposes only. It will be kept strictly confidential. Your answers will be seen by no one except the person who does the tabulating.

Consult no one in filling out this questionnaire, except to get necessary information to which you do not have access.

If a question is followed by the letters Y N, draw a circle around the Y if your answer is Yes, and draw a circle around the N if your answer is No.

Leave no questions unanswered.

1. What is your height?.....feet.....inches. Weight.....pounds.
4. In what state or country were you born?

5. In what state or country was your father born?
 6. What was your father's nationality (ancestry)?
 7. In what state or country was your mother born?
 8. What was your mother's nationality (ancestry)?
 9. Were your parents divorced after your birth? Y N.
 10. How old were you at the time of your father's death, if he is not living?
.....years.
 20. Which of your parents did you like the better? Father (), Mother ().
 21. Which of your parents exercised the most influence on your life?
Father (), Mother ().
 22. Do you feel that if you had your childhood to live over again, that you
would desire a change in your home and other environmental conditions?
Y N.
 23. Would you choose more sociable parents? (), less sociable ones (),
or the same ()?
 24. What was the general tenor of your family life? Formal (), Informal
(), Refined (), Unrefined (), Happy (), Gloomy (), Quarrel-
some (), Peaceable ().
 25. Who was the dominant one in the family?
 26. As a child how were you treated in general in comparison with your broth-
ers and sisters? Better (), Worse (), Average ().
- (There are 70 questions altogether.)

QUESTIONNAIRE 2

VOCATIONAL INTERESTS

(Directions are similar to those for Questionnaire 1.)

5. Did you ever plan to take a civil service examination? Y N. Did you
ever take a civil service examination? Y N. Did you pass? Y. N.
6. Is your present vocational choice due to the advice of a friend (), rela-
tive (), vocational adviser (), teacher (), school friend (), ac-
quaintance (), someone in the same vocation (), to reading (), or
to a consideration of your own abilities ()? You may check more than
one.
7. In what occupation and position do you see yourself ten years from now?
.....
8. What income do you expect to command at 50? \$.....
9. Did you ever quit a job because

The work was too hard for you physically?.....	Y	N
There was too much noise?	Y	N
The work was too dirty?	Y	N
The work was too monotonous?	Y	N
You were not promoted often enough?	Y	N
You disagreed with the boss?	Y	N
You felt that the job offered no future?.....	Y	N

(There are 13 questions altogether.)

CHOICE OF OCCUPATIONS

(Third page of Questionnaire 2.)

After each of the occupations listed there are three symbols. Cross out one of the symbols after each occupation, as follows:

Cross out L if you would like doing that kind of work.

Cross out D if you would dislike doing that kind of work.

Cross out ? if you have decided feelings toward that kind of work, or know nothing about it.

Disregard any salary or social differences or any possible family objections. Consider only your interest and satisfaction in doing each of the kinds of work listed. You are not asked whether you would take up the occupation permanently; you are merely asked if you would enjoy that kind of work. Assume that you have the ability necessary for each of the occupations.

Be sure to cross out one symbol after each of the occupations. Do not skip any.

Actor	L ? D	Mechanical engineer	L ? D
Architect	L ? D	Member of Congress	L ? D
Artist	L ? D	Musician	L ? D
Astronomer	L ? D	Newspaper reporter	L ? D
Auctioneer	L ? D	Novelist	L ? D

(There are 72 occupations in the list.)

QUESTIONNAIRE 3

AVOCATIONAL INTERESTS

(Directions are similar to those for Questionnaire 1.)

3. Have you ever constructed a piece of furniture or household appliance other than in a school shop? Y N.
4. Do you think that you could find out what was wrong with a watch that did not run? Y N. An electric motor? Y N. An auto? Y N. A gasoline motor? Y N.
5. Did you ever build a coop or a house for an animal? Y N.
6. Have you ever kept pet animals? Y N. What ones?.....
7. Have you ever made a collection of stamps? Y N. Coins? Y N. Postal cards? Y N. What else?
8. Did you ever own a camera? Y N. Which type of picture do you prefer to take, scenes () or snapshots of people ()? Check only one.
44. Estimate how many smokers, lodge meetings, card parties or other social affairs of your own sex you have attended during the past year..... Estimate how many mixed social affairs you have attended during the past year..... Include dances, parties, socials, etc. Do not include ordinary "dates."
45. How many plays have you acted in?.....
46. Can you successfully tell a story to a group of people? Y N.
47. Name the social clubs, fraternities, and business organizations to which you belong.....
Draw a line under each one which you attend regularly.

(There are 76 questions in this list.)

QUESTIONNAIRE 4

LIKES AND DISLIKES

Cross out one of the symbols after each of the items below, as follows:

Cross out L! if you like the item very much.

Cross out L if you like the item.

Cross out ? if you have no decided feelings toward the item.

Cross out D if you dislike the item.

Cross out D! if you dislike the item very much.

You may be in doubt in some cases. Use your own judgment, always checking the symbols in the way which expresses your *most frequent attitude*.

Be sure to cross out one symbol after each of the items. Do not skip any.

Blondes	L!	L	?	D	D!
Brunettes	L!	L	?	D	D!
Very old people	L!	L	?	D	D!
Children	L!	L	?	D	D!
Cripples	L!	L	?	D	D!
People who disagree with you	L!	L	?	D	D!
People more intelligent than you	L!	L	?	D	D!
People less intelligent than you	L!	L	?	D	D!
People who borrow things	L!	L	?	D	D!
Quick-tempered people	L!	L	?	D	D!
Conventions	L!	L	?	D	D!
Sporting pages	L!	L	?	D	D!
Love stories	L!	L	?	D	D!
Detective stories	L!	L	?	D	D!
"Life"	L!	L	?	D	D!

(There are 129 such items.)

QUESTIONNAIRE 5

BELIEFS

Draw a circle around Y if your answer is Yes.

Draw a circle around N if your answer is No.

This information is wanted for statistical purposes only.

Your answers will be kept strictly confidential.

Do you believe

1. That Japan and the United States will be at war with each other within the next forty years? Y N.
2. That divorce laws should be made stricter? Y N.
3. That prize fights should be prohibited? Y N.
4. That capital punishment should be abolished? Y N.
5. That unstinted service is always rewarded? Y N.

(There are 82 questions in this list.)

RESULTS

The numbers at the heads of the paragraphs below refer to the questions in the original lists. Only significant positive results are presented here.¹ The groups compared are the two primary groups and the Case School seniors.

Questionnaire 1. Early Personal History

5. Eighty per cent of the fathers of the salesmen were born in this country; 60 per cent of the fathers of the industries students; and 53 per cent of the fathers of the engineering students.

6. The per cents of fathers of American or British nationality among the three groups to whom the questionnaire was given are: primary sales group, 73 per cent; primary mechanical group, 56 per cent; and Case School seniors, 46 per cent. American nationality: 23, 13, and 11 per cent, respectively.

7. The per cents of mothers born in this country are: salesmen, 83 per cent; industries seniors, 43 per cent; and engineering students, 72 per cent.

8. The per cents of mothers of American or British nationality are as follows: salesmen, 67 per cent; industries students, 43 per cent; and engineering students, 39 per cent. American nationality, 26, 6, and 7 per cent, respectively.

12. Education of *fathers*:

	PER CENTS FINISHING		
	GRADES	HIGH SCHOOL	COLLEGE
Succ. 1. i. salesmen	82	46	19
Industries seniors	73	31	4
Mech. Eng. seniors	77	42	16

13. Education of *mothers*:

	PER CENTS FINISHING		
	GRADES	HIGH SCHOOL	COLLEGE
Succ. 1. i. salesmen	96	54	14
Industries seniors	78	44	0
Mech. Eng. seniors	86	43	7

¹It is impossible to present the complete questionnaires and results here. Those interested in examining the questionnaires may obtain copies from the Bureau of Personnel Research at Carnegie Institute of Technology. Those questions not reported on in this section revealed no group differences or merely insignificant ones, or showed differences but were omitted because the data were irrelevant to the present study.

15. Parent "taken after":

	PER CENT TAKING AFTER			
	FATHER	MOTHER	BOTH	NEITHER
Succ. l. i. salesmen	57	30	10	3
Industries seniors	47	50	0	3
Mech. Eng. seniors	51	42	7	0

16. Side of ancestry resembled:

	PER CENT RESEMBLING	
	FATHERS	MOTHERS
Succ. l. i. salesmen	57	43
Industries seniors	47	53
Mech. Eng. seniors	49	46

17. There is a slightly greater tendency among the salesmen to be the oldest or youngest of a large family of boys. They belong to larger families than the members of the other two groups. In this respect the engineering students occupy an intermediate position. The number of only children is proportionately the same for the three groups.

19. The occupations of fathers were classified in six rough groups. The number of times each type is mentioned as a father's occupation is shown below.

	SALESMEN	IND.	MECH. ENG.
Farming	6	2	4
Commerce ✓	12	4	20
Industry	5	12	10
Professional	10	1	9
Sales	2	0	5
Clerical	0	6	1

20. Parent liked better:

	PER CENT PREFERRING		
	FATHER	MOTHER	BOTH ✓
Succ. l. i. salesmen	7	40	53
Industries seniors	0	63	37
Mech. Eng. seniors	15	60	30

21. Parent exercising the most influence on their lives:

	PER CENT NAMING		
	FATHER	MOTHER	EQUAL
Succ. l. i. salesmen	27	57	17
Industries seniors	0	93	7
Mech. Eng. seniors	34	59	7

22. Percentages of men who would want a change in their home

and other environmental conditions if they had their lives to live over again :

	PER CENT
Succ. 1. i. salesmen	23
Industries seniors	33
Mech. Eng. seniors	29

24. Practically all of the men characterize their family life as "informal, refined, happy, and peaceable." Five engineering students, one industries student, and no salesmen check "unrefined." Five engineering students, three industries students, and no salesmen check "quarrelsome."

25. Dominant member of family :

	PER CENT NAMING		
	FATHER	MOTHER	NEITHER
Succ. 1. i. salesmen	57	17	26
Industries seniors	50	30	20
Mech. Eng. seniors	62	37	3

26. Treatment as a child compared with brothers and sisters :

	PER CENT TREATED		
	BETTER	WORSE	AVERAGE
Succ. 1. i. salesmen	13	0	87
Industries seniors	7	7	86
Mech. Eng. seniors	13	0	87

27. Financial circumstances of family :

	PER CENT INDICATING		
	POOR	MODERATE	WELL-TO-DO
Succ. 1. i. salesmen	10	60	30
Industries seniors	17	80	3
Mech. Eng. seniors	9	12	79

28. Social inclinations of family :

	PER CENT	
	MORE OFTEN INVITER	MORE OFTEN INVITED
Succ. 1. i. salesmen	43	57
Industries seniors	65	35
Mech. Eng. seniors	64	36

30. Percentages whose family acquaintanceship was limited to people of the same religious belief :

	PER CENT
Succ. 1. i. salesmen	23
Industries seniors	30
Mech. Eng. seniors	30

31. Father's religious belief :

	PER CENT	
	CATHOLIC	PROTESTANT
Succ. l. i. salesmen	3	83
Industries seniors	26	53
Mech. Eng. seniors	7	81

32. Mother's religious belief :

	PER CENT	
	CATHOLIC	PROTESTANT
Succ. l. i. salesmen	3	90
Industries seniors	23	60
Mech. Eng. seniors	7	83

41. Per cents who had a desire to run away from home :

	PER CENT
Succ. l. i. salesmen	23
Industries seniors	10
Mech. Eng. seniors	19

Per cents running away from home :

	PER CENT
Succ. l. i. salesmen	7
Industries seniors	3
Mech. Eng. seniors	2

43. A tendency is shown for salesmen to be brought up in a better residential district than the industries students. The latter are more often residents of small towns.

44. Per cents desiring a wealthier environment if they had their lives to relive :

	PER CENT
Succ. l. i. salesmen	17
Industries seniors	30
Mech. Eng. seniors	28

45. Per cents desiring more refined playmates :

	PER CENT
Succ. l. i. salesmen	27
Industries seniors	33
Mech. Eng. seniors	26

46. Per cents desiring more cheerful conditions :

	PER CENT
Succ. l. i. salesmen	17
Industries seniors	37
Mech. Eng. seniors	35

53. Fistfights engaged in before the age of twelve:

	MEDIAN NO.	PER CENT WINNING		
		MORE THAN HALF	HALF	LESS THAN HALF
Succ. l. i. salesmen	3.7	23	60	17
Industries seniors	13.0	64	18	18
Mech. Eng. seniors	5.0	41	37	22

66. Per cent of income earned while attending high school:

	MEDIAN PER CENT
Succ. l. i. salesmen	7
Industries seniors	11
Mech. Eng. seniors	9

69. Per cent of expenses earned at college:

	MEDIAN PER CENT
Succ. l. i. salesmen	9
Industries seniors	21
Mech. Eng. seniors	14

Questionnaire 2. Vocational Interests.

6. Reasons for present vocational choice:

	FREQUENCY AMONG		
	SALESMEN	IND.	MECH. ENG.
Advice of a friend	11	3	7
Advice of a relative	10	3	14
Advice of a school friend	3	0	6
Advice of someone in same vocation	12	3	7
Consideration of own abilities	22	20	35

8. Income expected at the age of 50:

	MEDIAN
Succ. l. i. salesmen	\$19,300
Industries seniors	16,500
Mech. Eng. seniors	10,500

9. Reasons for ever quitting jobs:

	FREQUENCY AMONG		
	SALESMEN	IND.	MECH. ENG.
Not promoted often enough	6	3	2
Disagreed with the boss	5	9	6

11. Per cents bothered if they were watched at work:

	PER CENT
Succ. l. i. salesmen	5
Industries seniors	31
Mech. Eng. seniors	30

The occupational choices which showed the greatest group differences are given in Table II. No statistical procedure was used

in selecting these items beyond omitting all which did not show differences of ten per cent or more. If the item was skipped or if both L and D were checked, credit was given for checking the question mark.

TABLE II

Group Comparisons in Choice of Occupations. Percentages of each group checking L (Like) after the occupations. The groups are the two primary groups and the Case School seniors in mechanical engineering.

PER CENTS OF EACH GROUP CHECKING
L AFTER THE OCCUPATION

	SA.	IND.	M.E.
Actor	46	20	23
Architect	43	50	55
Astronomer	13	36	23
Automobile salesmen	63	53	37
Auto racer	26	40	34
Auto repairman	10	46	49
Aviator	56	60	58
Bank teller	20	33	11
Baseball player	46	66	28
Carpenter	20	40	37
Cook	3	13	9
Dentist	10	16	13
Draftsman	10	43	39
Editor	43	30	32
Explorer	36	60	72
Factory manager	40	90	90
Farmer	23	26	15
Foreign correspondent	50	30	18
Hotelkeeper or manager	26	36	15
Labor arbitrator	20	33	18
Lawyer	60	36	18
Locomotive engineer	20	43	34
Machinist	10	50	46
Magazine writer	53	23	28
Mechanical engineer	30	43	90
Musician	50	70	69
Newspaper reporter	40	20	23
Novelist	33	13	20
Office clerk	3	10	2
Office manager	50	66	51
Philanthropist	56	43	30
Politician	33	23	9
Preacher	23	3	9
Promoter	50	70	49
Real estate salesman	43	26	13

TABLE II—Continued

	PER CENTS OF EACH GROUP CHECKING L AFTER THE OCCUPATION		
	IO	60	44
Ship officer	10	60	44
Shop foreman	3	56	51
Social worker	33	30	15
Specialty salesman	56	20	30
Steeple-jack	6	10	18
Stock broker	53	63	37
Surgeon	53	30	37
Toolmaker	3	50	32
Traveling salesman	36	40	32
Watchmaker	3	23	18

Questionnaire 3. Avocational Interests

1. The following table presents the most important differences in attitudes toward school subjects.

	PER CENTS CHECKING L (LIKE) AFTER THE SUBJECT		
	SA.	IND.	M.E.
Shop work	20	83	95
Economics	80	50	86
Sociology	67	26	60
Mechanical drawing	33	53	88
Manual training	30	63	93
Ancient languages	13	17	4
Civics	77	63	86
Public speaking	53	40	53

3. Per cents who constructed a piece of furniture or a household appliance other than in a school shop:

	PER CENT
Succ. 1. i. salesmen	43
Industries seniors	75
Mech. Eng. seniors	79

7. Per cents making collections of

	STAMPS	COINS	POSTAL CARDS
Succ. 1. i. salesmen	59	50	48
Industries seniors	44	44	41
Mech. Eng. seniors	55	41	46

8. Per cents who owned cameras:

	PER CENT
Succ. 1. i. salesmen	90
Industries seniors	75
Mech. Eng. seniors	72

Per cents preferring to take pictures of people rather than scenes :

	PER CENT
Succ. l. i. salesmen	28
Industries seniors	23
Mech. Eng. seniors	35

18. Magazines read regularly :

	NUMBER WHO READ THE MAGAZINE REGULARLY AMONG		
	SA.	IND.	M.E.
Literary Digest	12	8	5
American Magazine	20 ✓	7	13
Saturday Evening Post	9	13	19 ✓
System	7	0	0
Annalist	0	5	0
Outlook	0	10	0

19. Favorite magazine :

	SA.	IND.	M.E.
Literary Digest	5	4	1
American Magazine	15 ✓	8	10
Saturday Evening Post	6	4	10

20. Per cents who have had the impulse to express their opinions on current topics in letters to newspapers :

	PER CENT
Succ. l. i. salesmen	62
Industries seniors	50
Mech. Eng. seniors	51

22. Per cents who have written poems :

	PER CENT
Succ. l. i. salesmen	21
Industries seniors	33
Mech. Eng. seniors ✓	44

The same proportions between the groups held for those who had poems appearing in print.

28. Median age at which the groups learned to dance :

	MEDIAN AGE (YEARS)
Succ. l. i. salesmen	15
Industries seniors	17.5
Mech. Eng. seniors	18 ✓

30. The salesmen have engaged in each of the following activities to approximately twice the extent of the industries or mechan-

ical engineering students: dramatics, musical organizations, debating, school politics, and public speaking.

37. Per cents who smoke:

	PER CENT
Succ. 1. i. salesmen	80
Industries seniors	50
Mech. Eng. seniors	37

40. Per cents of men who spent a vacation traveling around for the mere pleasure of traveling:

	PER CENT
Succ. 1. i. salesmen	52
Industries seniors	30
Mech. Eng. seniors	41

42. Median number of states in which a month or more was spent:

	MEDIAN
Succ. 1. i. salesmen	5.25
Industries seniors	3.00
Mech. Eng. seniors	2.00

43. Median number of cities and towns lived in for six months or more:

Succ. 1. i. salesmen	4.3
Industries seniors	3.0
Mech. Eng. seniors	2.3

49. Numbers having (only) a few close friends:

	FREQUENCY
Succ. 1. i. salesmen	0
Industries seniors	5
Mech. Eng. seniors	2

Numbers having both close friends and a great many ordinary friends:

	FREQUENCY
Succ. 1. i. salesmen	29
Industries seniors	22
Mech. Eng. seniors	36

51. Median number of persons with whom a social correspondence is maintained:

	MEDIAN NUMBER
Succ. 1. i. salesmen	7
Industries seniors	5
Mech. Eng. seniors	3.5

52. Median number of social letters written per week:

	MEDIAN NUMBER
Succ. l. i. salesmen	3.75 ✓
Industries seniors	3.30
Mech. Eng. seniors	1.90

53. Religious beliefs:

	PER CENT				
	CATH.	PROT.	JEWISH	NO PREF.	NON-BEL.
Succ. l. i. salesmen	3	90	0	3	3 ✓
Industries seniors	23	67	3	7	0
Mech. Eng. seniors	3	85	5	3	5

55. Per cents who have tried to convert anyone to their religious point of view:

	PER CENT
Succ. l. i. salesmen	18
Industries seniors	37
Mech. Eng. seniors	19

60. Per cents believing in:

	SA.	IND.	M.E.
The evil eye	6	0	2
Yogi philosophy	13	0	0
Fletcherism	37	10	37
Vivisection	47	23	51
Memory systems	77	43	74
Pelmanism	27	13	16
Mental telepathy	✓ 60	30	63
New Thought	20	3	16
Osteopathy	57	37	72
Phrenology	40	10	49
Astrology	27	43	14
Character analysis (Blackford)	63	50	79 ✓
Vegetarianism	33	47	37

68. Per cents believing:

	PER CENT		
	SA.	IND.	M.E.
That they have had less than their share of luck	13	27	7

71. Per cents who have fainted away:

	PER CENT
Succ. l. i. salesmen	37
Industries seniors	10
Mech. Eng. seniors	26

74. Personages considered their ideal by the three groups:

	FREQUENCY		
	SA.	IND.	M.E.
Lincoln	11	13	18
Roosevelt	8	1	3
Washington	4	3	3
Robert E. Lee	2	0	0
Napoleon	1	4	2
Christ	1	1	3
Carnegie	1	1	0

The following personages are mentioned once by the industries students: Vanderlip, Merriwell, Brutus, and Moses. The following are mentioned once by the engineering students: Caesar, Hannibal, J. P. Jones, Grant, King Richard of England, Edison, Alexander, and Aeneas.

Brill (2) calls the answer to this question the person's empathic index. The answer indicates the person's trend of adjustment to the world. A certain personage is admired because of a wish to emulate his mode of reaction to the world. He expresses in his life the conscious and unconscious strivings of those who consider him their ideal.

Questionnaire 4. Likes and Dislikes

The most important group differences found are the following: the salesmen show a greater proportionate liking for fat men, conventions, "Life," and interviews; the industries students show a greater proportionate liking for very polite people and "The New Republic." The per cents of the salesmen, industries students, and mechanical engineering students, respectively, checking L! or L after each of these items are: fat men: 55, 17, and 37; very polite people: 47, 90, and 40; conventions: 73, 53, and 49; "Life": 97, 77, and 93; "The New Republic": 33, 77, and 14; interviews: 77, 33, and 51.

Questionnaire 5. Beliefs

Table III shows the most important group differences found in attitudes toward the questions.

TABLE III

Group Comparisons in Reactions to Questions in Questionnaire 5. Percentages checking Y (yes) among the two primary groups and the Case School Seniors in Mechanical Engineering.

DO YOU BELIEVE	PER CENT CHECK- ING Y (YES)		
	SA.	IND.	M.E.
3. That prize fights should be prohibited?	33	20	18
5. That unstinted service is always rewarded?	70	40	49
7. That all men are created equal?	70	33	51
8. That the United States should build a stronger navy than any other nation?	43	10	20
10. That preparedness for war is the best guarantee of peace?	73	33	30
15. That modern writers are not as good as the classical writers?	50	30	32
16. That every man has his price?	20	56	28
17. That Mars is inhabited by living beings similar to man?... ..	43	26	62
20. That few men of good taste or intelligence are found among the rich?	6	30	4
24. That "spare the rod and spoil the child" is the best maxim to use in raising children?	23	43	20
32. That Americans are stronger physically than Europeans?..	93	63	65
33. That the more children a man has, the greater his value to the community?	20	43	23
42. That the boy who does poorly in school usually turns out a success?	6	26	9
44. That the accumulation of money makes a man heartless?..	20	46	20
45. That the government should grant pensions to the aged?..	46	67	49
58. That a man's clothes are an index of his character?	70	40	60
60. That war is ever justifiable?	83	50	51
64. That the union principle of the closed shop is better than the open shop for American industry?.....	16	36	39
65. That Abraham Lincoln is the foremost man in American history?	20	50	76

SUMMARY

The outstanding features of the data presented in the preceding pages may be summarized as follows:

Questionnaire I.

(1) A greater proportion of the sales group than the other two groups are of native or British Protestant stock. Their parents were better educated and wealthier than those of the industries students. They were thus afforded the advantage of a better social adaptation in this country, which may have been a factor in their choice of salesmanship as a vocation.

(2) The industries students were apparently subjected to greater maternal influence in childhood than the salesmen. We find that more industries students than salesmen "took after" their mothers; more resembled the mother's side of their ancestry; more of them liked their mothers in preference to their fathers; more of them state that their mothers exercised the most influence on their lives; and more of them state that their mothers were dominant in the family. A possible explanation is that the predominant influence of the mother may have caused the industries students to become less successfully adapted toward other individuals. They may have clung to their mothers' apron-strings for too long a period in childhood. On the other hand, the attachment to the mother may have been symptomatic of more fundamental factors influencing personality. We should expect to find among the industries students compensatory reactions for the weaknesses expressed in their attitudes toward their mothers, in that they may have taken an aggressive attitude toward their social environment instead of a tactful one.

(3) The industries students were evidently not wholly satisfied with their early environment. A greater proportion of them than of the salesmen would desire a change in their home and other early environmental conditions if they were to live their lives over again. More of them would prefer a wealthier environment, more refined companions, and more cheerful conditions. They were treated slightly worse than their brothers and sisters. Their early lack of tactful social adjustment is demonstrated by the fact that they engaged in more fistfights as children than the salesmen.

Questionnaire 2.

(4) In their choice of occupations the salesmen tend to choose the characteristically social occupations and the industries students the mechanical ones. Occupations preferred in greater proportion by the salesmen are: actor, automobile salesman, editor, foreign correspondent, lawyer, magazine writer, newspaper reporter, novelist, philanthropist, politician, preacher, real estate salesman, specialty salesman, and surgeon. The industries students are more inclined toward the following occupations: astronomer, auto re-

pairman, bank teller, baseball player, carpenter, draftsman, explorer, factory manager, hotelkeeper or manager, labor arbitrator, locomotive engineer, machinist, mechanical engineer, musician, office manager, promoter, ship officer, shop foreman, stock broker, toolmaker, and watchmaker. It is an interesting fact that salesmen prefer literary occupations, while the industries students prefer financial occupations.

Questionnaire 3.

(5) In their attitudes toward school subjects the industries students show the expected liking for shop work, mechanical drawing, and manual training. The salesmen prefer economics, sociology, civics, and public speaking.

(6) The salesmen show their social proclivities in that they learned to dance earlier in life and maintain a greater social correspondence than the industries students. They probably make themselves less objectionable by not trying to convert people to their religious point of view, although in this respect the industries students show a more marked sales tendency than the salesmen themselves.

(7) Salesmen are more credulous in that they tend toward a greater belief in pseudosciences.

(8) Among the salesmen the ideal personage is more often Roosevelt and less often Lincoln. Roosevelt expresses a more normal vigorous empathic index. Lincoln expresses an ethical and conscientious attitude toward life.

Questionnaire 4.

(9) Salesmen show a greater preference for fat men, conventions, interviews, and "Life." Industries students show a greater preference for very polite people and "The New Republic." The connotations of a preference for good-natured fat men and for "Life" are obvious. Salesmen probably show less liking for very polite people because such people are less free in their social expressions and are more difficult prospects to handle.

Questionnaire 5.

(10) In their beliefs salesmen show greater credulity and con-

formity with popular opinion than the industries students. The latter display to a great extent the laboring man's attitude.

In most respects the mechanical engineering students occupy an intermediate position, although their leanings are in the direction of the industries students rather than the salesmen. We may conclude that engineering draws men with slightly greater social proclivities than a course such as the one which the industries students follow.

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CHAPTER IV

GROUP COMPARISONS BASED ON RATINGS

Group comparisons based on ratings were made in order to deal with a number of traits, (some of which presumably were also measured by the tests and questionnaires), which seemed to be related to the personalities studied. Ratings were obtained on only three groups: the two primary groups and the Case School seniors in mechanical engineering. The data include self-ratings by the members of these groups, plus ratings on them by acquaintances. 2 21

THE METHOD

All the ratings reported here were made on the same scale, a graphic rating scale which afforded ratings on twenty traits. The graphic rating scale is a form in which the rating is indicated by a check along a straight line, under which are printed descriptive phrases indicative of varying degrees of the trait, from one extreme to the other. The advantages of this form of scale are set forth in another place by the writer (6). The directions for the present scale and an illustrative item are given below.

GRAPHIC RATING OF.....

INSTRUCTIONS FOR USING THE RATING SCALE

1. Let these ratings represent your own judgments. Please do not consult anyone in making them.
2. In rating this person on a particular trait, disregard every other trait but that one. Many ratings are rendered valueless because the rater allows himself to be influenced by a general favorable or unfavorable impression which he has formed of the person.
3. When you have satisfied yourself on the standing of this person in the trait on which you are rating him, place a check at the appropriate point on the horizontal line. You do not have to place your check directly above a descriptive phrase. *You may place your check at any point on the line.*

1. Is he absent-minded or wide awake?

.....
Very absent-minded. Often becomes Usually present- Always wide awake and
Continually absorbed abstracted and out of minded alive to present
in thought touch with his situation
surroundings

In the reproduction the length of the line on which the rating is made is reduced. In the original it is $6\frac{5}{8}$ inches long.

The "good" ends of the scales were alternated in order to counteract a motor tendency to check at one edge of the blank. The time required for making the twenty ratings was approximately ten minutes.

To score the ratings a stencil was used, one of whose edges was marked off for a distance equal to the length of the graphic rating line. This space was divided off into twenty spaces of equal length, consecutively numbered from left to right. The stencil was placed beneath the line on which the rating was made, so that this line coincided with the marked-off space on the stencil. The score was the number of the space over which the check was made. If the check was made over a division line between two spaces, the score to the right was assigned to the rating. An X-shaped check was scored at the intersection of the two lines, and a V-shaped check at the point of the V. If more than one check was made on the same scale for the same person, indicating doubt on the part of the rater, the average of the ratings was taken. Since the same stencil was used for all the scales, all scores read from left to right. No total score was obtained.

The following additional directions were used in obtaining self-ratings from the industries students. Similar directions were used in obtaining self-ratings from the other two groups.

"It is requested of each senior in Industries that he fill out the enclosed blank and mail it to this office. Our purpose in asking for this information is to provide a check on the tests which were recently given, by comparing ratings on character traits with the test scores.

"The rating scale which is enclosed was not intended for self-rating, but we wish you to use it in that way. Let the ratings which you make represent your judgments on *your own* traits. That is, you are to judge yourself, taking the point of view of an impartial observer. If you care to, you may add marginal comments to make your ratings clearer or to supplement them.

"We wish to make it absolutely clear to you that these ratings will be kept *confidential*. None of the records will go out of this office. They will *not* be made known to the employment office or to any of your instructors. Do not sign your name to the blanks."

The scales were numbered so that they could be identified

when returned. The industries students returned their ratings by mail, but the other two groups rated themselves in the classroom, with instructions similar to the above. In order to get ratings by acquaintances on these men, as checks on their self-ratings, each member of the three groups gave the names of five men to whom the scale could be sent. To each of these references were sent a copy of the scale and a letter requesting ratings on the student. Out of approximately 400 rating scales sent out, 80 per cent were returned completely filled out. Except in rare instances, no two men were rated by the same judge; that is, with rare exceptions, no two men gave the same reference. All self-ratings and ratings by acquaintances were made anonymously.

Distribution tables of self-ratings and ratings of others were drawn up and the interquartile ranges were calculated. The ratings of others include all ratings, and since some men were rated by five references and others by merely one, the ratings of others do not completely represent the groups. All of the engineering students were rated by three or more people, but about one-fifth of the other two groups were not rated at all by others.

RESULTS

The interquartile ranges of the self-ratings and the ratings of others for the three groups are shown graphically in Fig. 8. In order to make the results more apparent and to bring out features which would not otherwise be noted, the rating scale instead of the scale of scores is placed below the lines.

There are several outstanding facts about these ratings.

(1) The general tendency is for raters to make checks directly above descriptive phrases. This is to some extent an error in the use of the scale which should be overcome with practice, and to some extent a weakness in the scale itself.

(2) Several of the scales, especially those for Traits 1 and 2, are shown by the interquartile ranges to be defective. The central phrase in every scale should be a neutral one, or should express the most common condition of the trait found in the population at large. The defects of these two scales are made evident by the displacement of the distributions, due to the fact that the central

phrases are more nearly allied in meaning to the unfavorable than the favorable ones.

(3) Several other scales,—those for Traits 16 and 17, for instance,—are defective because, as indicated by the narrow range of ratings, the intermediate phrases are more nearly like the extremes than they are like the central phrase. Raters therefore tended to avoid them.

(4) The general trend is for acquaintances to rate the men higher or more favorably than they would rate themselves. This is true for Traits 1, 2, 3, 4, 6, 7, 9, 11, 12, 14, 19, and 20. Whether this is due to self-depreciation on the part of the subjects of the study or to flattery on the part of their acquaintances, cannot be determined. As we are not in possession of the facts, the ratings must be accepted at face value.

(5) The differences between the groups in self-ratings and in the ratings of others are in most cases slight, but they gain significance from the fact that in almost every case where a difference appears in self-ratings it is corroborated by the ratings of others, and from the fact that the differences are consistent. The directions of the differences between the successful life insurance salesmen and the industries seniors are shown below, based on self-ratings.

1. Salesmen are more wide-awake
2. Salesmen are more good-natured
3. Salesmen are neater
- * 4. Salesmen are more excitable
7. Salesmen are less self-conscious
9. Salesmen have a more impressive bearing
- * 10. Salesmen are more self-confident
11. Salesmen are more even-tempered
13. Salesmen are more adaptable
- * 14. Salesmen make friends more quickly
- * 15. Salesmen are more open-hearted
18. Salesmen are more talkative
- * 20. Salesmen work faster

The differences starred are those which may be called very sig-

nificant, according to the criterion for the significance of differences explained in Chapter 2.

The above differences are reversed by the ratings of others in Traits 9, 11, and 20. Every one of the differences but these three is corroborated by the ratings of others on the men. In addition, the differences are borne out by the self-ratings of the seniors in mechanical engineering. These self-ratings differ from the self-

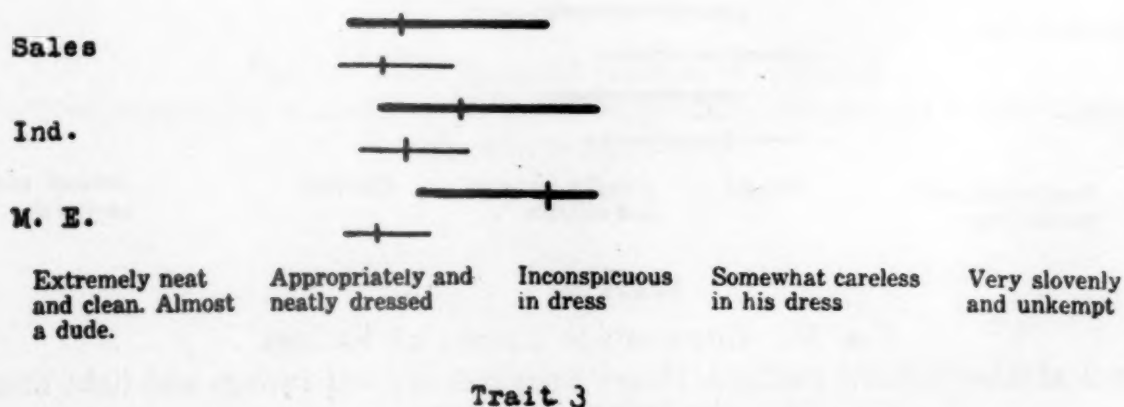
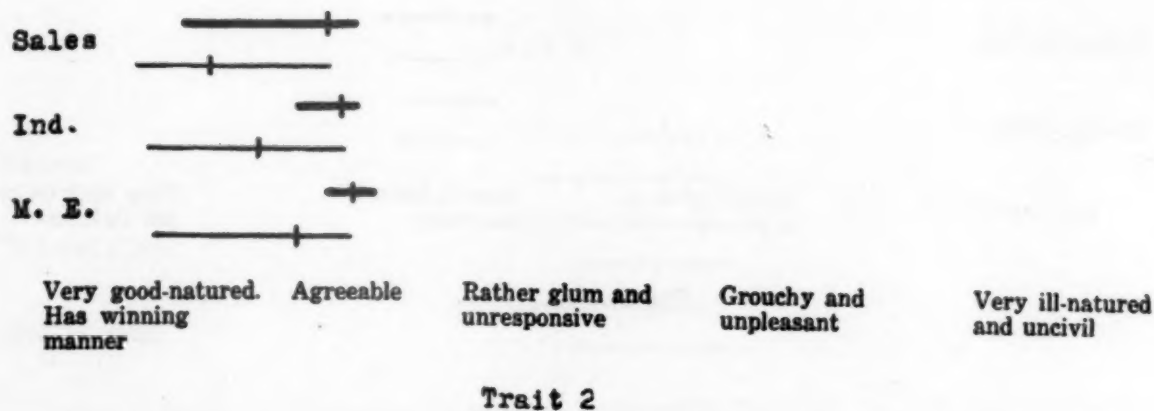
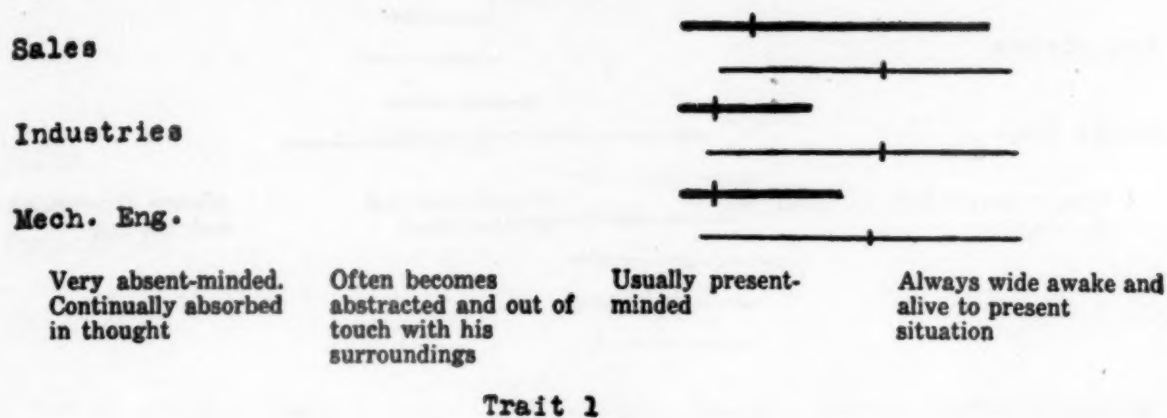


FIG. 8a. Interquartile Ranges of Ratings.
Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

ratings of the salesmen in the *same direction* as do those of the industries seniors in every one of the traits in the above list. In approximately half the traits they differ more from the salesmen than the industries seniors do, but in every case this difference is in the same direction as the industries seniors.

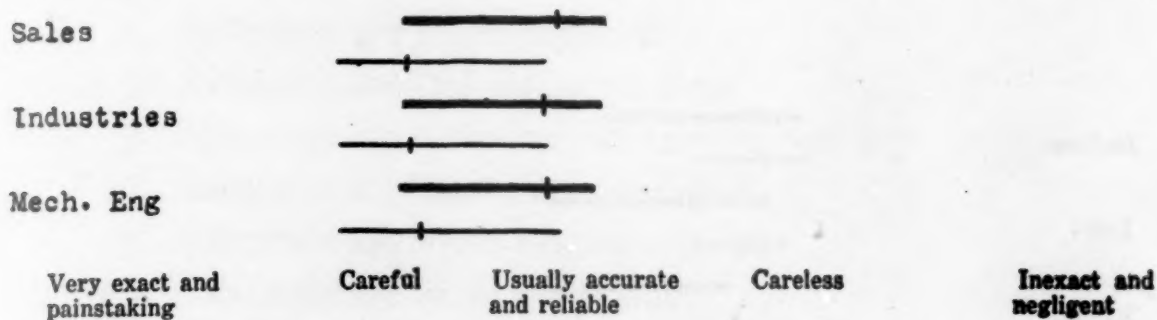
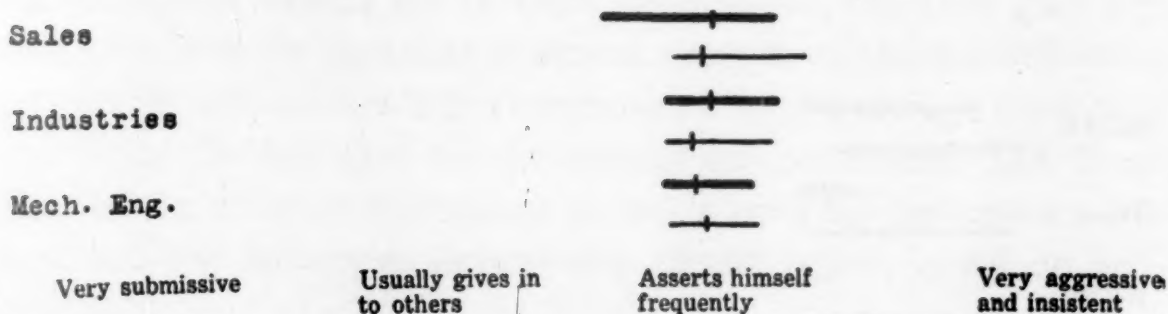
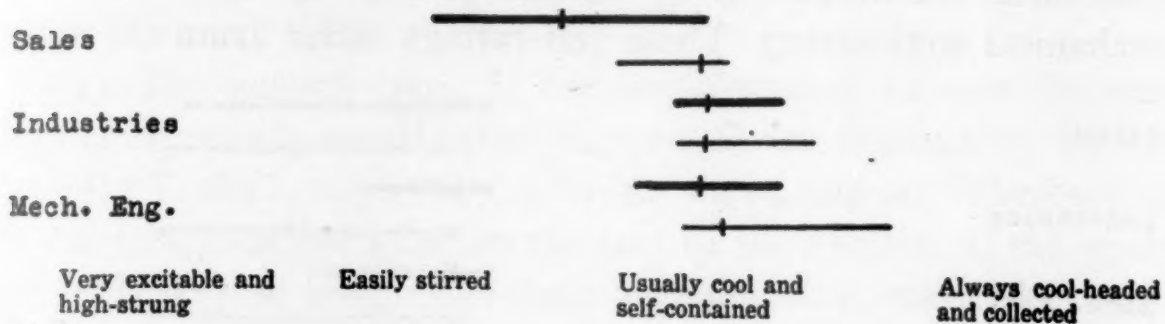


FIG. 8b. Interquartile Ranges of Ratings.
Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

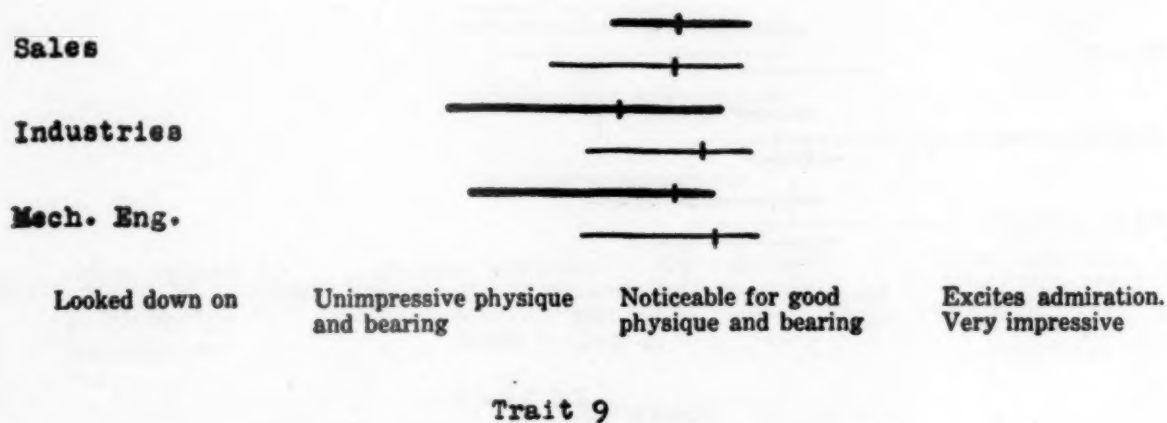
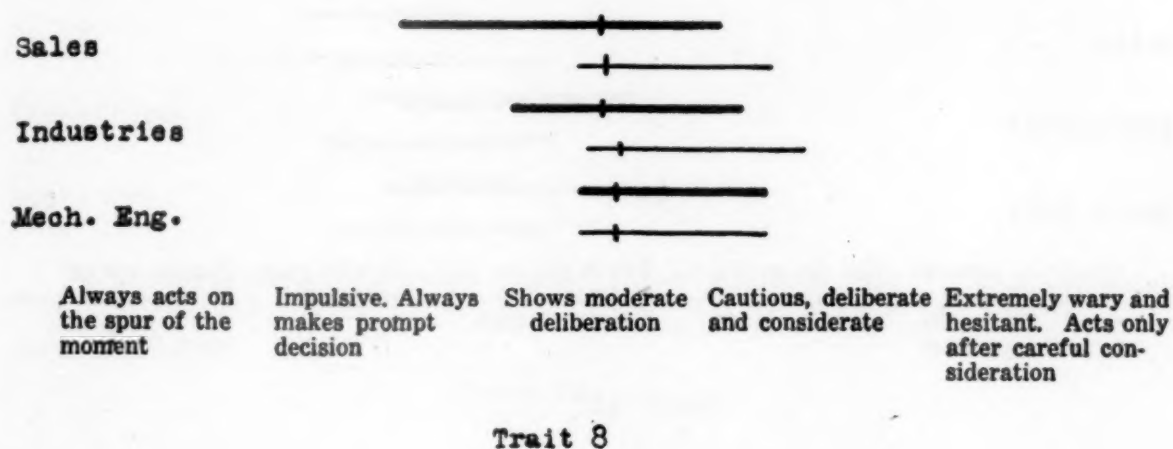
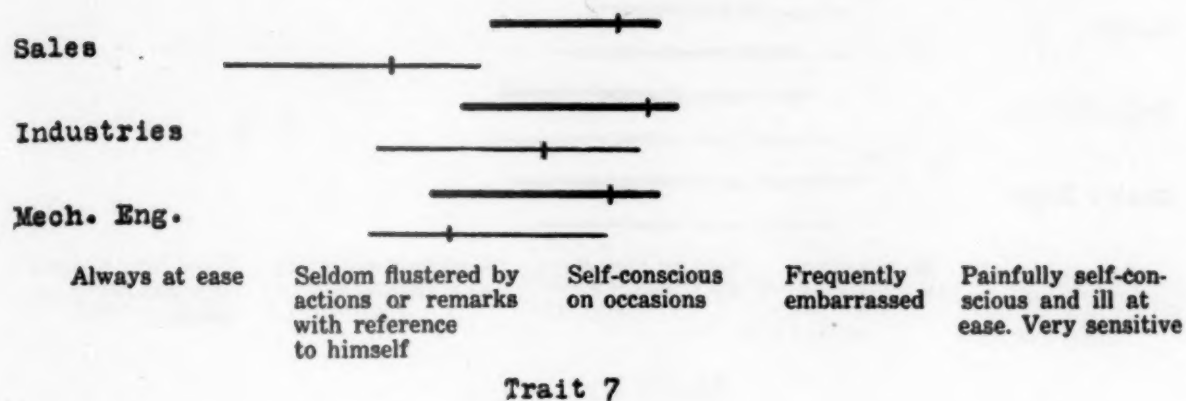


FIG. 8c. Interquartile Ranges of Ratings.
Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

Sales

Industries

Mech. Eng.

Judges himself
capable of
anythingExaggerates
his abilitiesKnows just what
he is capable ofUnderestimates his
own abilitiesConsiders himself
incapable of much
success

Trait 10

Sales

Industries

Mech. Eng.

Often has extreme
ups or downs in
mood. Shows elation
or depressionHas ups or downs
at times without
apparent reasonShows change of
feelings when conditions
warrantUsually even-
temperedEven-tempered.
Maintains the same
mood in spite of
cause for changing

Trait 11

Sales

Industries

Mech. Eng.

Never speaks
depreciatingly
of othersRarely criticises
othersComments on out-
standing weaknesses
or faults of othersCriticises
othersExtremely critical
of others

Trait 12

FIG. 8d. Interquartile Ranges of Ratings.

Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

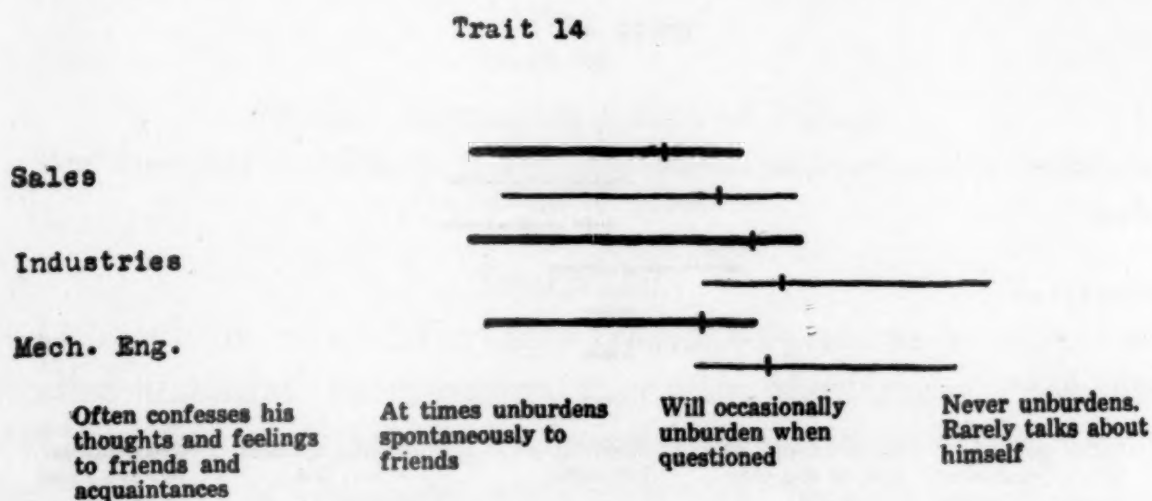
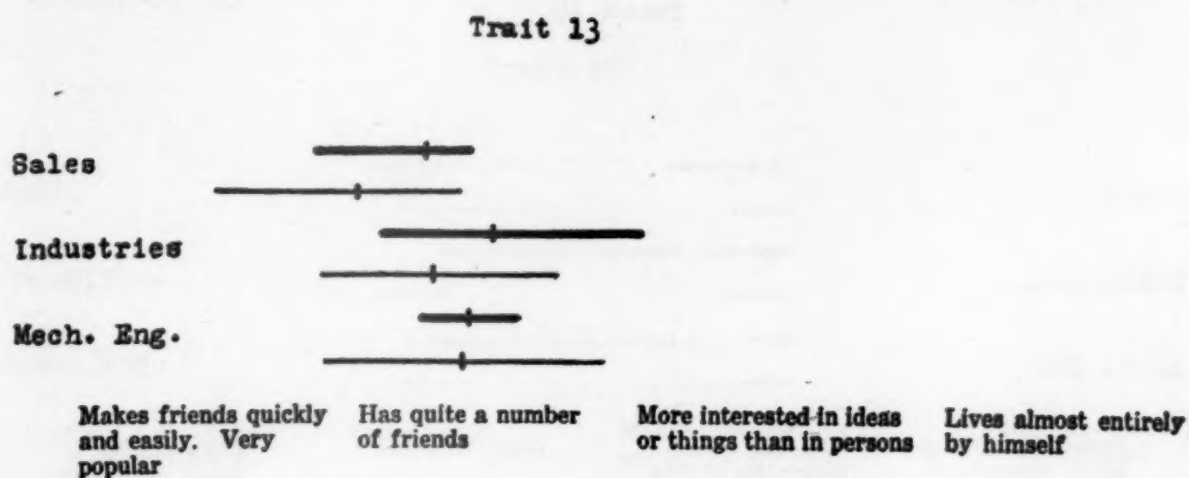
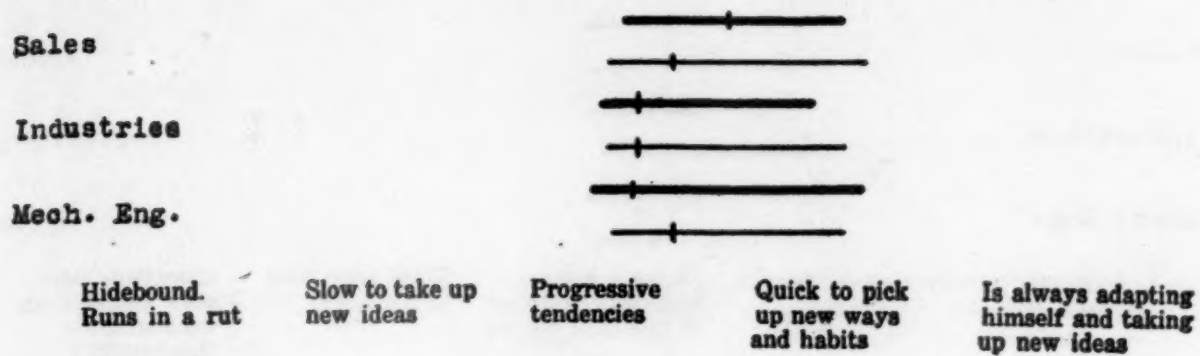


FIG. 8e. Interquartile Ranges of Ratings.
Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

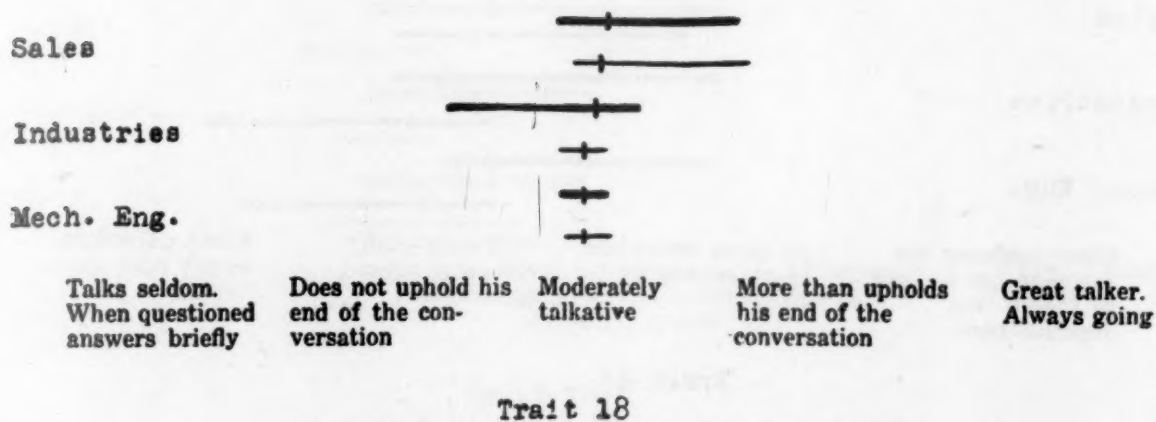
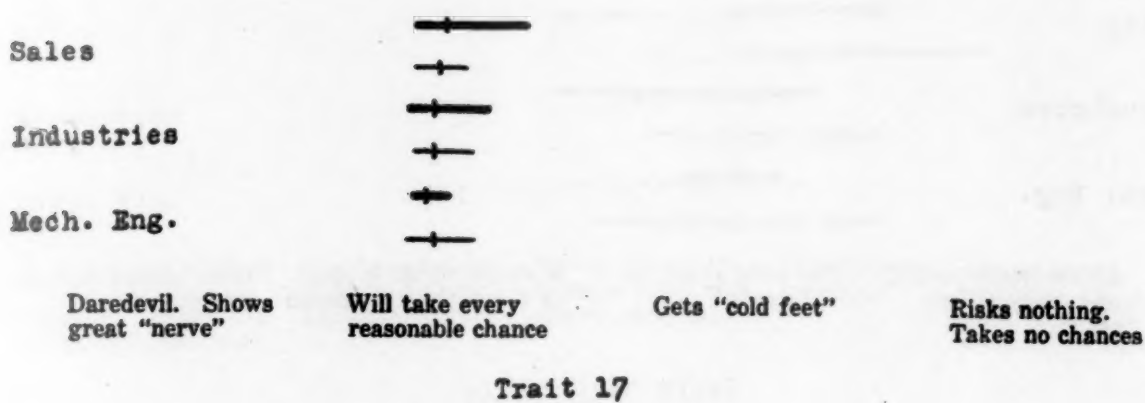
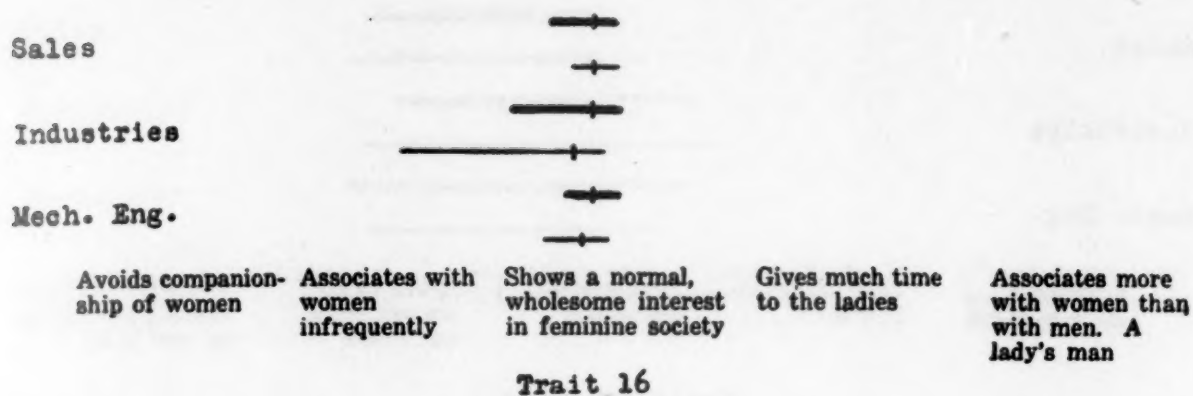


FIG. 8f. Interquartile Ranges of Ratings.
Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

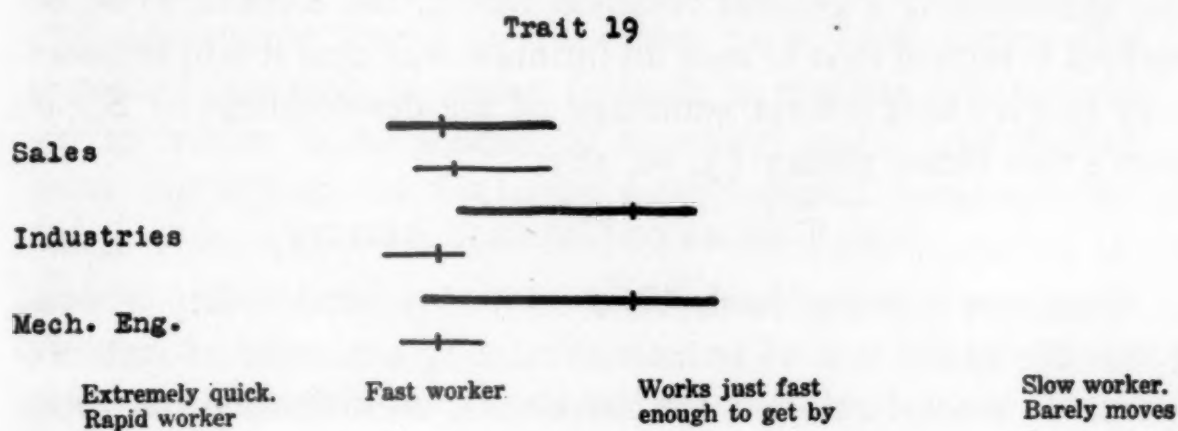
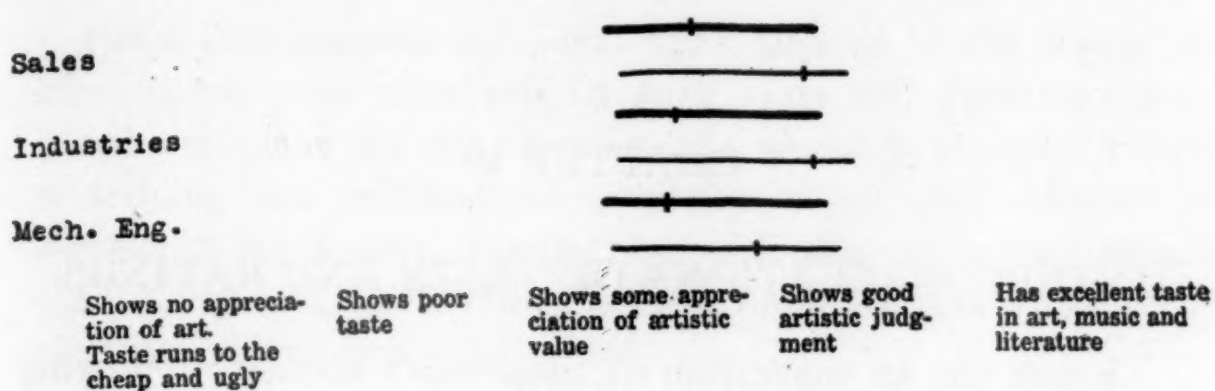


FIG. 8g. Interquartile Ranges of Ratings.

Vertical lines indicate medians. Heavy lines indicate self-ratings and light lines the ratings of others.

SUMMARY

Although the rated differences are not so great as to withstand detailed statistical examination, they gain significance from the fact that they are psychologically consistent, that self-ratings and the ratings of others corroborate each other in most of the traits, and that the differences between the primary groups in self-ratings are borne out by the self-ratings of engineering seniors.

The most significant differences between the primary groups are in Traits 4, 10, 14, and 15. They lead to the conclusion that salesmen are more excitable, more self-confident, and more open-hearted than industries seniors, and make friends more quickly.

There is a less significant tendency for salesmen to be more wide-awake, good-natured, adaptable, and talkative, neater, and less self-conscious than industries seniors.

CHAPTER V

INTERCORRELATIONS OF TESTS AND RATINGS

Though not an application of Spearman's method of proving the existence of a general common factor, the method to be described is related to it in such an intimate way that it will be necessary to give first a brief summary of the development of Spearman's two factor theory (3, 10, 18).

THE THEORY OF GENERAL ABILITY

Spearman first put forth his theory of general ability in 1904 (18). He found that after intercorrelating a number of measurements of mental abilities, the correlation coefficients could easily be arranged in a hierarchical order, *i.e.*, so that on the whole each coefficient was greater than any to the right of it in the same row or below it in the same column.

"This fact of 'hierarchical' order which he had thus discovered was taken by Professor Spearman to indicate the presence of some common fundamental function which saturates in different degrees the different activities, and is the sole cause of correlation between them except in the case of very similar activities.

"It can easily be shown that if all the correlations are due solely to one common or general factor, then the correlation coefficients will be in perfect hierarchical order. . . .

"Since clearly *perfect* hierarchical order cannot be expected in any *experimental* research, it becomes important to know what deviation from perfection can be allowed without giving up the idea of a general factor: or on the other hand, what approach to perfection can be attained without the presence of a general factor." (3, pp. 165-166)

Spearman devised a formula for correcting for observational errors which, applied to his correlation coefficients, enabled him to arrange them in perfect hierarchical order. The suppositions underlying this formula have been called in serious question by Thomson (3).

Researches between 1904 and 1912 differed in the degree of hierarchical order obtained. In 1912 Hart and Spearman proposed a criterion for the existence of a hierarchical order, whose underlying idea was that the correlation of adjacent columns of correlation coefficients, if perfect hierarchical order existed, would equal unity, and that its value is therefore a measure of the completeness of the hierarchical order.

We need not concern ourselves in detail with the criticisms leveled against the theory by Thomson, aside from noting that he produced hierarchical order through a random overlapping of group factors in the absence of a general factor, and that he attacks the validity of Spearman's correctional formulae. He replaces Spearman's two-factor theory (a factor specific to the ability, and general common factor: intelligence) by a sampling theory of ability, preferring "to think of a number of factors at play in the carrying out of any activity such as a mental test, these factors being a sample of all those which the individual has at his command." (3, p. 188)

METHOD EMPLOYED IN THIS STUDY

A possibility of the table of intercorrelations which seems to have been overlooked by these writers is to study through them the differences existing between groups as regards the interrelationship of their traits. It cannot be said that differences greater than those to be expected by chance between two tables of intercorrelations of the same measurements obtained from two different groups of subjects would account for two general factors, but it seems possible that these differences would at least show what specific factors were common to the members of a group. Suppose that in Group A we find the three highest intercorrelating measurements to be 1, 2, and 3; and in Group B the three measurements showing the highest intercorrelations to be 8, 9, and 10; all these intercorrelations to be over $+.90$. Even though these differences were too great to be ascribed to errors of observation, they could not be attributed to the degree to which the variables were saturated with a general common factor. They must be due to the constitution of the two groups, and these varying factors in

the two groups can only be described in terms of the intercorrelating traits themselves. Thus, for unknown reasons, Traits 1, 2, and 3 always accompany each other in equal degrees in the members of Group A, forming a *constellation* of traits for that group; similarly, Traits 8, 9, and 10 form a constellation for Group B.

A second possibility is to make tables of the intercorrelations of traits obtained from merging the two groups, and then having found what traits form constellations, all men considered, to determine to what degree the groups differ in the extent of the constellation which they possess. If, for instance, we should find that Traits 5, 6, and 7 formed a constellation with the data from all the groups combined, it would be interesting to note if the groups differed in their possession of these traits, the latter accompanying each other in a large amount in one group and in a small amount in the other group. This could be determined by comparing distribution tables of the amounts of each trait possessed by the two groups.

I have used both of these procedures with the groups on which the figures were available: the two primary groups and the Case School seniors in mechanical engineering. The correlations were all obtained by the Spearman fourfold table method, which although merely an approximation and subject to considerable error, is perhaps as reliable as any, considering the number of persons in the groups. The following tables of intercorrelations of measurements were obtained:

1. Intercorrelations of self-ratings for the sales primary group.
2. Intercorrelations of self-ratings for the mechanical primary group. Trait 17 was omitted, as the form of distribution of this trait did not permit of the calculation of correlations.
3. Intercorrelations of self-ratings for the Case School seniors in mechanical engineering. Trait 17 was omitted.
4. Intercorrelations of average ratings for 84 cases. These 84 cases were members of the three preceding groups who had been rated by two or more acquaintances. The *average rating* for any man in any trait was a figure obtained by first averaging the opinion of his acquaintances on this trait, and then averaging this combined opinion with the man's self-rating on that trait, giving his

self-rating and the combined judgment of his acquaintances equal weight.

5. Intercorrelations of all test scores for the sales primary group.

6. Intercorrelations of all test scores for the mechanical primary group.

7. Intercorrelations of all test scores for the 84 men mentioned in connection with the fourth table above.

8. Correlations of all test scores with the average ratings of these 84 men.

These tables of intercorrelations are not reproduced here.

In calculating the correlation coefficients where ratings were concerned, one end of the range of actual ratings was arbitrarily accepted as the better end. In many of the scales either end represents an extreme which is undesirable, but checks were rarely made over these extremes. Within the limits of distributions of checks, the good end is easily distinguished. In correlating ratings, the rating at the 'good' end of the scale was called high, and the trait was called by the 'good' name. In doing this numerical scores were disregarded as expressions of the amount of the trait, and were used merely to obtain medians. The effect is as if the good end of the scales were always to the right instead of being alternated, and as if a rating to the right of the median were considered high and to the left low, and the name of the trait were always the right extreme.

In obtaining intercorrelations where tests were concerned, a high score represented a high standing.

It is unfortunate that writers on the general factor theory give us no method for the closest approximation to hierarchical order where that order is not immediately and obviously made. Brown and Thomson mention in passing two methods, or rather two variations of the same method (3, p. 177, footnote, and p. 185). The method rests on the probability that the ability represented in the upper row and left-hand column in a hierarchical order approaching perfection will have a larger total correlation than any other ability represented in the table, and that the total correlations of the other abilities will be in the same order as their

position in the table. A brief method of ranging the measured abilities in hierarchical order is, therefore, to range them in the order of the sums of their correlations with the other abilities (their total correlation).

In doing this we are immediately confronted with the question: shall we take the algebraical totals of the correlation coefficients or shall we disregard the signs in computing the sums? In the one example given by Brown and Thomson all the coefficients are positive. If, however, the hierarchy were arranged with only high positive coefficients in the upper left-hand corner, we should expect a number of high negative correlation coefficients in the lower right-hand corner. The last situation is practically impossible, since a group of traits cannot show very high negative intercorrelations. It is possible for a group of traits to show a great many high positive intercorrelations and a few negative ones. Thus, Traits 1, 2, and 3, may intercorrelate very highly (averaging $+.90$, for example), and Trait 4 may correlate negatively with each of these traits. The constellation of traits would then consist of Traits 1, 2, 3, and 4, the first three accompanying each other to the same degree and being accompanied by inverse amounts of Trait 4.

In obtaining total correlations, therefore, the signs of the correlation coefficients have been ignored.

RESULTS

As the tables of intercorrelations will not be reproduced here, the reader will have to keep in mind what they aim to present. Each of the eight tables mentioned contains all the correlation coefficients resulting when each of the variables (ratings or tests) is correlated with each of the other variables with which the particular table is concerned. In addition, for each variable in each table, the *total correlation* is given, a figure which represents the sum of the correlation coefficients of that variable with each of the other variables in the table, the signs of the coefficients being neglected.

As a preliminary step, the total coefficients of the variables (self-ratings) in the first table were correlated with those in the second table and with those in the third table, and those in the second table

with those in the third table. These correlation coefficients were calculated by the rank order method. Thus in the first table, Trait 2 ranked first with a total correlation of 7.37, in the second table Trait 2 ranked fourteenth with a total correlation of 4.77, and in the third table Trait 2 ranked thirteenth with a total correlation of 5.05. The correlation of the values of the total correlation coefficients in the first and second tables is $-.21$, first and third $-.13$, and second and third $+.27$. In other words, the figures for the sales group correlate negatively with those for the two groups of mechanics students, whereas the latter correlate positively with each other. This indicates that the two groups of mechanics students will resemble each other as regards their constellations of traits more closely than either will resemble the sales group.

Out of each of the first three tables of intercorrelations the five traits with the largest total correlations were chosen. The intercorrelations of these traits are given below.

Sales primary group (data from first table) :

TRAIT	2	11	19	15	6
2		+.64	+.51	-.45	+.73
11			+.71	-.66	+.56
19				-.71	+.31
15					-.56

Mechanical primary group (data from second table) :

TRAIT	8	18	1	4	9
8		-.51	+.51	-.59	.00
18			+.66	+.16	+.77
1				+.51	+.51
4					+.68

Case School seniors (data from third table) :

TRAIT	18	4	5	13	16
18		+.31	+.77	+.71	+.59
4			+.64	+.37	+.40
5				+.66	+.28
13					+.56

In each of the above cases the traits are arranged in the order of their total correlations. In the first table, the five traits showing the highest total correlations are in order, 2, 11, 19, 15, and 6.

In the sales group positive amounts of Traits 2, 11, 19, and 6,

accompany negative amounts of Trait 15. The constellation for this group is therefore the following:

- 2. Good-nature
- 11. Even temper
- 19. Artistic taste
- 6. Accuracy in work
- 15. Close-heartedness

It should not be assumed that these phrases describe the group. They represent extremes of traits which accompany each other in these individuals. It is just as logical to give the names of the opposite traits to the constellation. By reference to Fig. 8 we find that the salesmen are more good-natured than the industries students, whereas the latter are more close-hearted. No important differences appear with respect to artistic taste, accuracy in work and even temper. The discriminating value of this constellation is therefore very slight.

For the industries seniors Traits 18, 1, 4, and 9 inter-correlate positively. Trait 8 shows no consistent relationship to the other traits and is consequently omitted in naming the constellation:

- 18. Talkativeness
- 1. Present-mindedness
- 4. Cool-headedness
- 9. Good bearing

Referring to Fig. 8, salesmen excel in talkativeness and present-mindedness, whereas the industries seniors excel in the other two traits.

The constellation for the seniors in mechanical engineering is:

- 18. Talkativeness
- 4. Cool-headedness
- 5. Self-assertion
- 13. Flexibility
- 16. Sociability with the other sex

No valuable conclusions as to group differences in constellations of traits can be drawn from these results.

Turning to the intercorrelations of average ratings (fourth table), we find the intercorrelations of the five traits with the largest total correlations to be as follows:

TRAITS	18	13	1	2	20
18		+.37	+.16	+.16	+.37
13			+.45	+.29	+.66
1				+.43	+.51
2					+.16

The constellation, though not very coherent, consists of the following traits:

- 18. Talkativeness
- 13. Flexibility
- 1. Present-mindedness
- 2. Good-nature
- 20. Quickness in work

In every one of these traits the sales group excels the industries students. Here we have the basis for a group differentiation as regards a constellation of traits. These traits form a constellation, perhaps in the general population, and also individually differentiate the two groups. The terms in the above list are then the best ones to apply to the general traits of the groups in differentiating them.

Similar comparisons with regard to test scores are less reliable since we have included several measures from the Kent-Rosanoff Test which are very closely related.

The five test scores with the largest total correlations for the sales group (fifth table) are all in the Kent-Rosanoff Test, being Adjective and Adverb Responses, Noun Responses, Speech-Habit Responses, Contrast Responses, and Responses with a Commonality Value of 1-5. The comparison of these results with those of the sixth table produced entirely negative results. No differentiating constellations were discovered.

The intercorrelations of test scores for three groups combined (seventh table) yield more favorable results. The intercorrelations of the five tests with the largest total correlation are given below. All are in the Will-Temperament Test.

TEST	PT. 9	PTS. 1 AND 10	PT. 9, r.	PT. 6, l.	PT. 4, r.
Pt. 9		+.03	-.61	+.31	+.19
Pts. 1 and 10			-.16	+.25	+.43
Pt. 9, r.				-.48	-.37
Pt. 6, l.					+.13

The constellation consists of negative amounts of Part 9, ratio, accompanying positive amounts of all the other tests.

An ideal arrangement would exist here if one group of subjects excelled the other in all of these tests except Part 9, ratio, and if every test in the five correlated highly with the constellation of rated traits on the preceding page. We should then have found a differentiating constellation of rated traits and adequate measures of them for use on other groups of subjects.

The sales primary group excels the industries group in Part 9, Part 6, letters, and Part 4, ratio. The industries students excel in Part 9, ratio, and very slightly in Parts 1 and 10. This seems to offer a possibility that the ideal arrangement would be obtained. The correlations of each of the five tests with each of the five ratings are given below (from eighth table).

TEST	TRAIT	18	13	1	2	20
Pt. 9		-.13	+.25	+.34	+.03	+.34
Pts. 1 and 10		.00	+.22	+.16	+.16	.00
Pt. 9, r.		+.06	-.37	.00	+.06	-.28
Pt. 6, l.		+.13	+.25	+.03	+.13	+.03
Pt. 4, r.		-.16	.00	+.03	-.22	-.06

This random group of correlation coefficients closes this line of approach.

SUMMARY

The results of this attempt to find differentiating constellations of traits are for the most part negative. This may be due partially to the unreliability of the correlation coefficients, and partly to the nature of the method for selecting the traits entering into the constellation.

The intercorrelations of average ratings showed the most positive results. With the data from the three groups combined, the following traits formed a constellation:

- 18. Talkativeness
- 13. Flexibility or adaptability
- 1. Present-mindedness
- 2. Good-nature
- 20. Quickness in work

In all of these traits the salesmen rate higher than the industries

seniors. The conclusion to be drawn from this is that the above five traits form a constellation (as far as our data show) and that the salesmen are distinguished from those who are mechanically inclined in that the former possess these traits to a more marked degree. Of all the rated differences between the two groups, these five traits could most readily be represented by one distribution curve on which salesmen and mechanically inclined people would occupy distinct positions.

CHAPTER VI

APPLICATION OF RESULTS IN A TOTAL SCORE

It is of interest to know how well the two general groups that are dealt with in this study can be differentiated by a total score which takes into consideration the significant individual items. If the items can be combined in such a way as to produce a total score which will clearly differentiate between men of extreme mechanical tendencies and those of sales tendencies, we shall have a convenient mode of discovering the propensities of an individual, and can use this information for vocational guidance along broad lines rather than specific ones,—lines which will probably lead to greater vocational happiness than any other method of vocational guidance can afford.

We have found that no single test or other measurement completely differentiates the two primary groups. If the most significant measurements are combined we shall have a total score which, although it may not differentiate as well as the most significant individual test, will yield the best combination of differentiation and reliability. Although an individual may not conform to his group in getting a high score in a certain test he may make up for this by having all of the interests of his group, and this reflected in his total score will place him properly. The extreme individuals will have a greater number of the interests and abilities of their group than will any of the intermediate individuals.

THE METHOD

The method of combining scores offers an interesting problem. I have followed with some modifications, the procedure of Ream (17). The ratings and all the questionnaires but 2 and 4 were left out of consideration because of the difficulty of gathering the material and scoring the blanks in any future applications of the method.

The application of the method of combining scores to the questionnaires has already been explained (7). It need be necessary only to review briefly what that procedure involves.

The problem is to discover the significant group differences in answers to particular items in the questionnaires, and to bring these differences together into a total scoring method by which their cumulative differentiating power will be a maximum. The steps in the solution of this problem are as follows:

1. For each of the two groups to be compared, make tables showing the frequency with which each symbol in the questionnaires is checked.

2. Select for statistical treatment those symbols which seem to show significant differences in the proportions of the two groups checking them.

3. In the case selected, determine the difference in proportion.

4. Determine the standard error of the difference in proportion by the formula given by Yule (formula 6, p. 269). The size of this standard error is an index of the probability of the difference in proportions arising through chance due to the fact that we have merely sampled the total number of persons engaged in the two types of occupation; in other words, it is an index of the universality of our findings.

5. List the cases in which the difference in proportions is at least twice as great as its standard error. These items should all receive equal weight in the total score. Yule claims that if the difference in proportion does not exceed three times the error of the difference, it may be obliterated by an error of simple sampling on taking fresh samples in the same way from the same material. But for practical purposes the probability of the difference being obliterated is very little less if the error is twice the difference in proportion, and this enables us to use a great many more items.

6. Determine which items will enter into the total score in a positive way and which in a negative way. This will depend on which group it is desired to favor in the total score. Thus, if we wish to "favor" the sales group, we assign positive values to symbols which are checked by a larger proportion of the salesmen than the students of mechanics, and negative values to symbols where the

opposite condition exists. The resultant total scores will reveal "higher" scores on the part of the salesmen, but this does not indicate a superiority, since the scores are merely relative, the main object being to differentiate the groups. It does not matter which group we select to assign the higher scores, but having selected one, plus and minus signs should be consistent throughout. All symbols should be given equal value, that is $+1$ or -1 ; since the criterion for inclusion is high (see 5 above) no weighting of symbols is necessary.

7. The total score for any person will be the algebraical sum of the positive and negative values attached to the significant items (symbols) which he checks.

The application of this method to test scores is fairly obvious. In the case of the two primary groups, critical scores were found by inspection which divided the distributions for the two groups into sections in which there were significantly different proportions of the members of the groups. For example, critical scores were set at 2 and 11 for the number of contrast responses in the Kent-Rosanoff Test. Seventeen per cent of the sales group and 53 per cent of the industries group obtained scores of 2 or less. Forty per cent of the sales group and 7 per cent of the industries group obtained scores of 11 or more. Both of these differences are significant and consequently enter into the total scores. The significances of the differences in proportion may be determined in the same manner and by the same formula as differences in proportions checking the symbols in the questionnaires. Thus, scores of 11 or more in the number of contrast responses may be treated the same as checking D after an item in a questionnaire; scores of 2 or less may be treated as checking L, and scores of 3 to 10 inclusive as checking ?. The significant differences are in the proportions checking L and D (scoring above 11 or below 2). Setting critical scores corresponds to the second step in the above outline.

A possible objection to this scoring method is that it leaves out of consideration in most cases the majority of the groups; that is, the majority of both groups may obtain scores of 3 to 10 inclusive in the number of contrast responses. This objection is not valid for the following reasons:

I have not set critical scores nor included in the total score items of questionnaires, no matter how significant the differences in proportion may have been, unless a fair proportion of the total number of individuals were taken into consideration. There would be no point in setting a critical score if only two members of one group and none of the other group were beyond it, or accepting an item (in a questionnaire) which was checked by 2 per cent of one group and 8 per cent of the other. It would require a great number of such partial scores to obtain a total score which would differentiate.

Those whose scores do not fall into any of the compartments formed by the critical scores and who consequently do not receive either a plus or a minus score for that measure, are not totally ignored in the composite score for that reason. Their score for that test is zero. This makes the dividing line between the two groups in the total score tend to be around zero, a convenient place for it. It also makes scoring a simpler matter. The method could be made more obvious by assigning to all those who score below 2 in the number of contrast responses a score of 1 toward their total score, assigning 2 to those who score from 3 to 10, and assigning 3 to those who score 11 or above.

A third answer to this objection is that even if a certain proportion of the groups were ignored in the total score because of their scores in any individual measurements, we should still have a logical basis for differentiation with our total score. We may assume that the factors which operate to cause one to go into an occupation are very diverse, and that any two or three are sufficient to place him in that occupation. Then as long as an individual falls into compartments showing significant differences in two or more tests or answers to questionnaires, he shows evidence of having been influenced by those two factors to place him in the occupation in which he finds himself. Only the extreme individuals are influenced by all of the factors.

RESULTS

The individual items from the two questionnaires and the tests which entered into the final score for differentiating the industries

seniors from the thirty successful life insurance salesmen, do not in every case differentiate the secondary groups from each other, but the results on the secondary groups were not tabulated until the final scoring method was drawn up.

In determining differences in proportions of symbols checked in Questionnaire 4, L! and L were combined and D and D! were combined, and not tabulated separately. The reason for doing this was that another form of the blanks in which only one kind of L and D occurred was given to most of the secondary groups, and if we wished to score them according to the final scoring method we should not have been able to do so unless we made this change.

The items which entered into the total score for differentiating the sales from the mechanical groups are given in Table 4 on the following page. The scoring method was decided upon by comparing the two primary groups, and the results of this comparison are in Table 4.

In obtaining the total scores the sales group was favored; that is, where a greater proportion of salesmen than industries students checked a given symbol, checking that symbol counted +1 toward the total score, and where the opposite relationship held, checking the symbol counted -1 toward the total score.

One member of the primary sales group failed to fill out several of the forms, and his figures are omitted entirely in the presentation of results. Three members of this group also failed to complete parts of Test IX.

Fig. 9 shows the results of the composite scoring method on the two primary groups. In this figure are shown the total composite scores, composite scores on tests alone, and on Questionnaires 2 and 4, separately and combined. Each component of the total composite score is very effective in differentiating the two groups.¹ The total score is, however, more effective than any of the compo-

¹ The only check we have on the reliability of these scores is the following: Eleven men in the Division of Cooperative Research at Carnegie Institute of Technology filled out Questionnaire 4 twice at an interval of one month. Their scores were obtained on those items which enter into the total score and occur in that questionnaire. Of the eleven, five obtained the same total score on this questionnaire, and four others gained or lost one point.

TABLE IV

Items which Entered into the Total Scoring Method for Differentiating Salesmen from the Mechanically Inclined. These are the items toward which the two primary groups (Sales, and Industries) differ in their attitudes. Checking the symbol after the given item or making the critical score was accorded the score in the last column.

TEST OR QUEST. ITEM	CRIT. SCORE OR SYMBOL	PER CENT MAKING CRITICAL SCORES OR CHECKING SYM.		WEIGHT
		<i>Sales</i>	<i>Industries</i>	
<i>Test IX</i>				
Part 5	2.10 or more	52	17	+I
Part 5	1.89 or less	26	60	-I
Part 11	16 or more	30	73	-I
Part 11	14 or less	44	13	+I
Part 9, ratio	1.20 or more	17	43	-I
Part 2	6 or more	60	20	+I
Part 2	3 or less	27	70	-I
<i>Kent-Rosanoff Test</i>				
Contrast Responses	11 or more	40	07	+I
Contrast Responses	2 or less	17	53	-I
<i>Questionnaire 2</i>				
Actor	L	46	20	+I
Astronomer	L	13	36	-I
Auto repairman	L	10	46	-I
Draftsman	L	10	43	-I
Factory manager	L	40	90	-I
Factory manager	D	33	03	+I
Locomotive engineer	L	20	43	-I
Machinist	L	10	50	-I
Machinist	D	63	26	+I
Magazine writer	L	53	23	+I
Magazine writer	D	20	50	-I
Preacher	L	23	03	+I
Ship officer	L	10	60	-I
Ship officer	D	56	20	+I
Shop foreman	L	03	56	-I
Shop foreman	D	73	16	+I
Specialty salesman	L	56	20	+I
Toolmaker	L	03	50	-I
Toolmaker	D	70	26	+I
Watchmaker	L	03	23	-I
<i>Questionnaire 4</i>				
Fat men	L! or L	53	17	+I
Fat men	D or D!	00	30	-I
Very polite people	L! or L	47	90	-I
Very polite people	?	33	00	+I
Conventions	D or D!	07	27	-I
"Life"	L! or L	97	77	+I
"Life"	?	00	23	-I
"New Republic"	L! or L	33	77	-I
"New Republic"	?	63	23	+I
Interviews	L! or L	77	33	+I
Interviews	?, D, or D!	23	67	-I

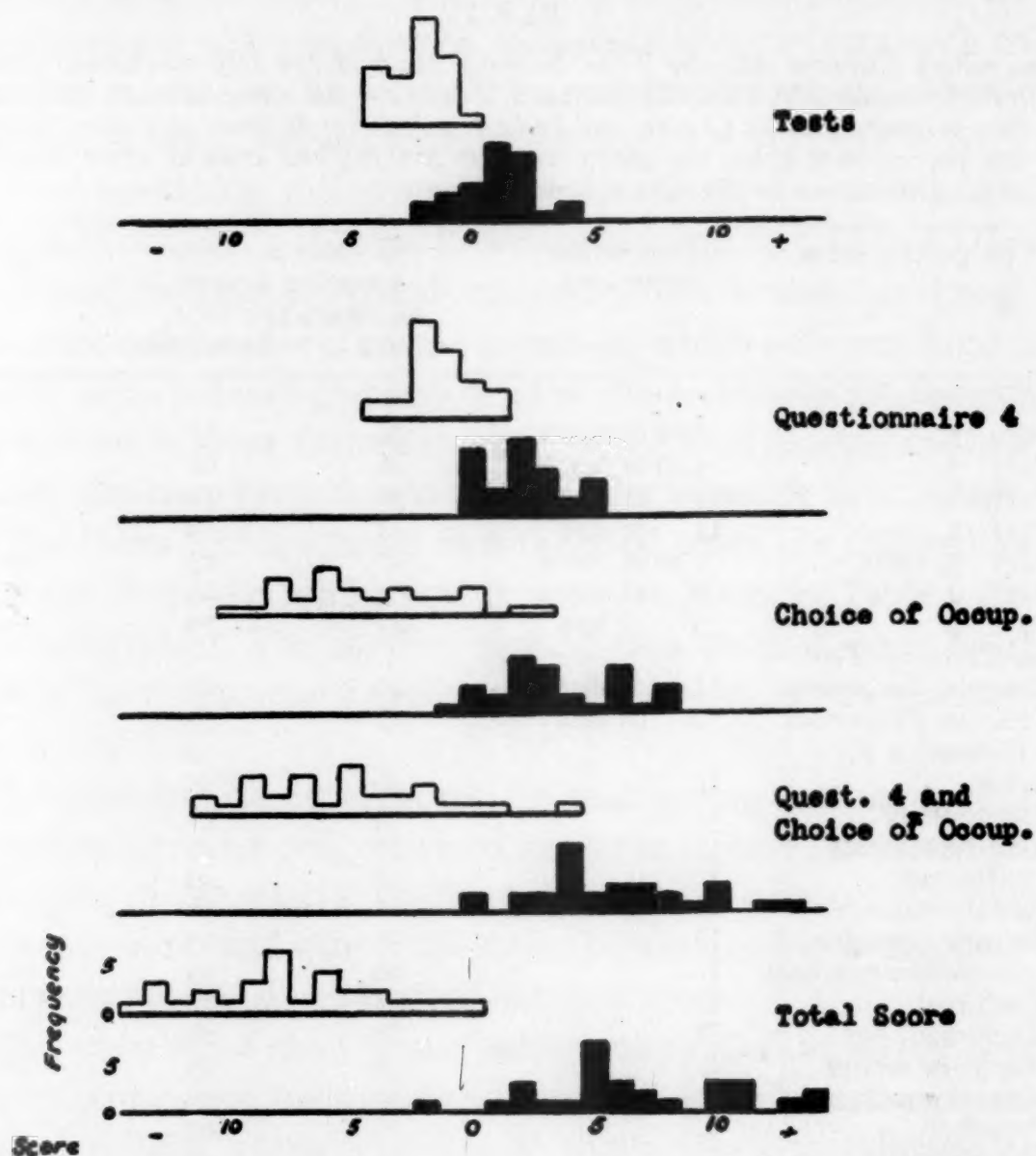


FIG. 9

Distribution of Total Scores and Scores on Separate Blanks for Thirty Industries Seniors (unshaded area) and Twenty-nine Successful Life Insurance Salesmen (shaded area).

nents, the overlapping being only one. Another interesting point is that the most favorable critical score for dividing the groups is near the zero point in each case.

The total composite score was obtained for the secondary groups. The interquartile ranges are presented in Fig. 10. The mechanical groups include the Industries seniors, '21 and '22, Carnegie Institute of Technology; Commercial Engineering and Mechanical Engineering seniors, '21, Carnegie Institute of Technology; and Mechanical Engineering seniors, '22, Case School of

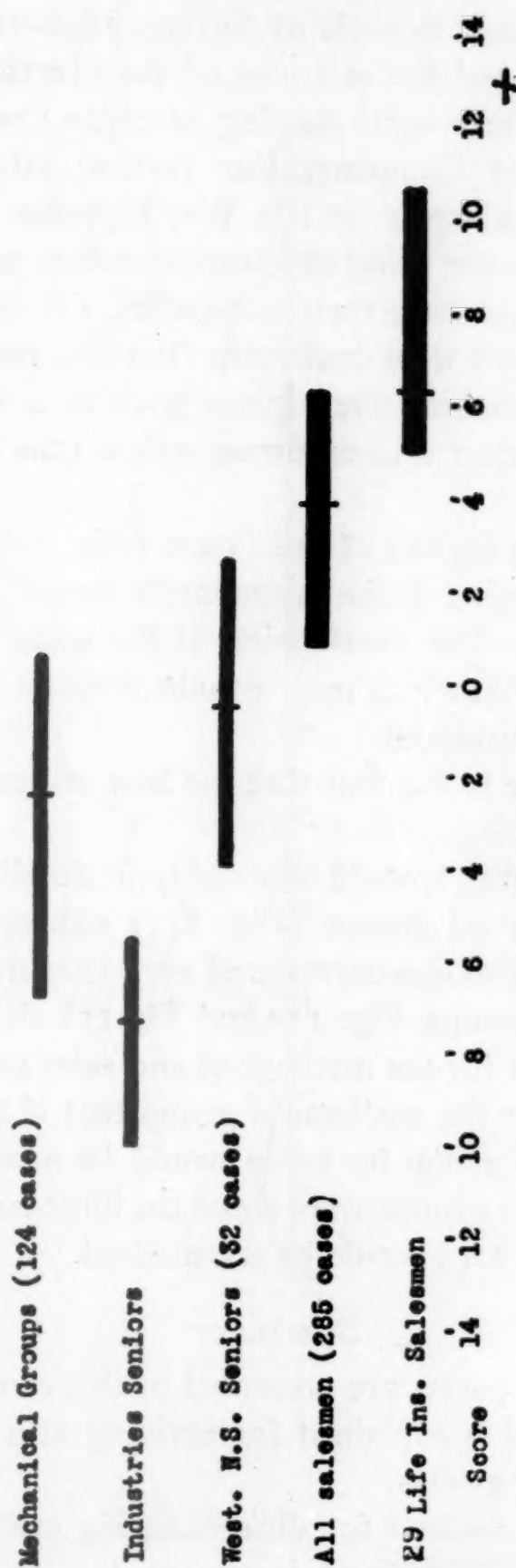


FIG. 10
Interquartile Ranges of Total Scores

Applied Science. The sales groups include the entire membership of the Life Insurance Schools of Spring, 1920-21, and Fall and Winter, 1921-22; and the salesmen of the Harrison Real Estate Corporation, the Burroughs Adding Machine Company, and the Cleveland Discount Company. For further information about these groups, see Chapter I. The Westinghouse seniors were a composite group, some being salesmen and some mechanics. Most of them neglected to state their occupation. Of the three making the lowest scores, two were draftsmen (the only two in the group), and of the three making the highest positive scores, one was a salesman and the other a sales correspondent (the only ones in the group).

The outstanding feature of this figure (Fig. 10) is the fact that there is no overlapping of the interquartile ranges of the sales and mechanical groups. The overlapping of the actual distributions is less than one-fourth, which may include all those individuals who are vocationally misplaced.

Another feature is the fact that the best critical score remains around the zero point.

There is a tendency toward bimodality in the distribution curve of total scores for all groups (Fig. 11c) although the tendency is not marked. The modes correspond very roughly to the medians of the two main groups. Fig. 11a and Fig. 11b show the complete distribution curves for the mechanical and sales groups. It is clear from the curve for the mechanical group that if there were more individuals in the group its mode would be around -3. If the numbers in the two groups were equal the bimodality of the curve for all cases (Fig. 11c) would be accentuated.

SUMMARY

Two important points are presented in this chapter.

(1) A method is explained for arriving at a scoring method for differentiating groups.

(2) A scoring method for differentiating salesmen from men who are mechanically inclined, is presented.

The main purpose of the chapter is to show how the results obtained in this study may be applied to practical problems in voca-

FIG. 11a
Distribution Curve of Total
Scores for Mech. Groups
(124 cases).

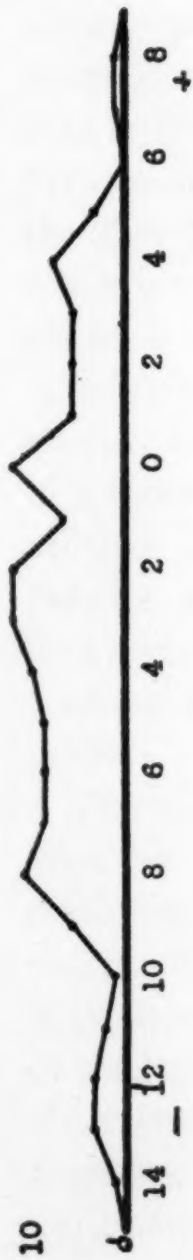


FIG. 11b
Distribution Curve of Total
Scores for All Salesmen
(285 cases).

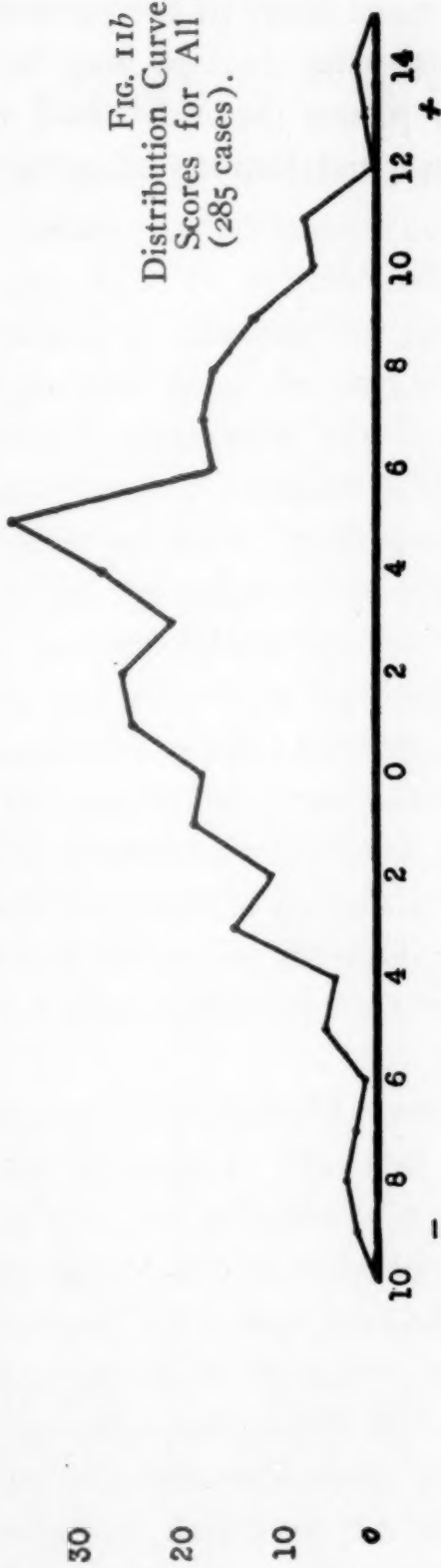
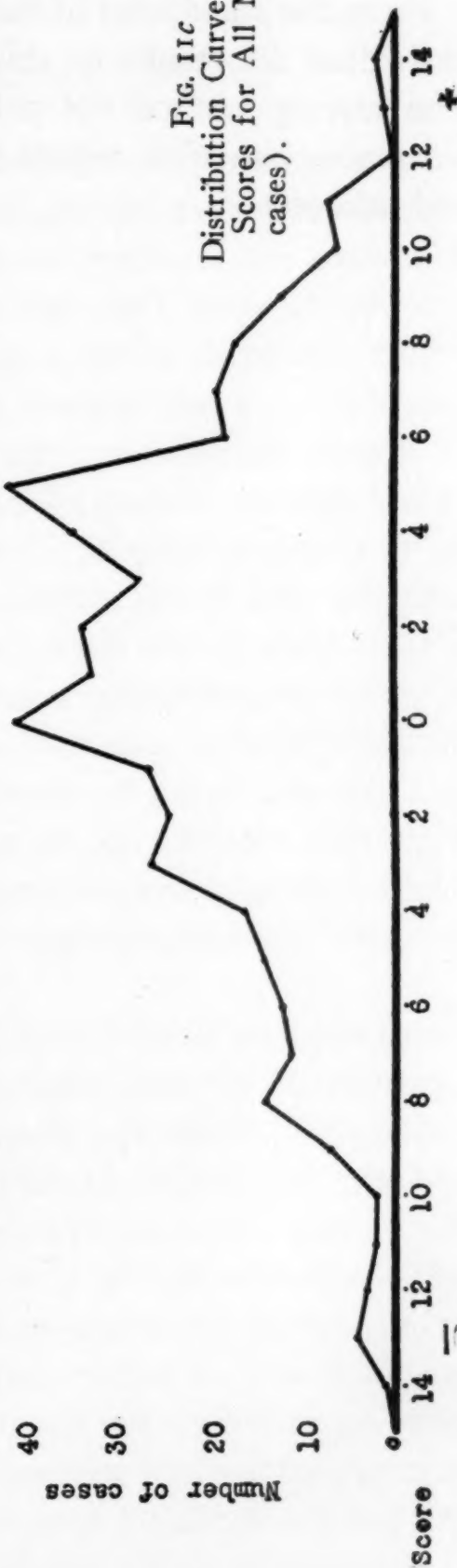


FIG. 11c
Distribution Curve of Total
Scores for All Men (441
cases).



tional guidance. By the use of this scoring method, we can discover the inclinations of any individual as regards mechanical or social types of occupation, and advise him accordingly.

From the standpoint of the mere study of the personality of any individual the results of this scoring method may be of interest. The scoring method not only places the individual vocationally, but places him with regard to constellations of personality traits and interests.

CHAPTER VII

SUMMARY AND CONCLUSIONS

There is nothing in the results submitted to prove the existence of *types* of people; rather can we conclude that *extremes* exist with regard to any trait or combination of traits. If we assume the normal probability distribution for any trait or combination of traits, the persons lying beyond sigma, to be dogmatic, may be said to belong to extremes. We find some evidence for a bimodal distribution, which Thorndike sets up as a criterion of types, in the distribution curves of total scores. In general, though, the evidence is against the existence of types. The great majority of people have no pronounced tendencies which warrant their placement in extremes, but only show leanings toward one or another of extremes. Leanings toward extremes are of psychological value, and in a sense this study has shown how they may be approached and utilized. The importance has been shown of a distribution of tendencies with mechanical inclinations at one extreme shading off into social inclinations at the other extreme, and to some extent the personality traits correlated with these tendencies have been determined.

The measures of personality used in this study are open to criticism on several points. The test results may be interpreted as measures of any one or more of a number of traits. The questionnaires may have been completed without regard for the truth. The ratings may have been invalidated because of a bias in favor of the persons rated, or because of errors of self-estimation. These objections are not fatal, since the interpretations of the function measured by any test will vary within rather narrow limits, and the interpretation placed on the tests cannot therefore be greatly in error; the purpose of the questionnaires was not so obvious as to indicate the most profitable direction of falsification; and if the raters were biased in favor of the subjects of the experiment, this

bias would be a factor common to all groups of raters and if necessary could be corrected for, but in any case this would not change the standing of any group relative to the other groups. If the ratings are not very accurate for any individual, they are at least sufficiently accurate for group comparisons. The most effective contradictions to the criticisms of the means by which the results were obtained, come from the fact that the tendency is for the results obtained with the three sets of forms to corroborate each other, and from the fact that the resulting description of the personality of the extremes of the two groups is psychologically consistent.

The following table summarizes the basis for the conclusions drawn as to differences in personality between the two groups.

TABLE V

TRAITS	TESTS	QUESTIONNAIRES	RATINGS
Salesmen are more			
Excitable			Trait 4
Self-confident			Trait 10
Open-hearted			Trait 15
Quick to make friends		3: 49	Trait 14
Present-minded			Trait 1
Good-natured		4: fat men, "Life"	Trait 2
Adaptable	Pt. 6, disguises		Trait 13
Talkative			Trait 18
Neat in dress			Trait 3
Less self-conscious	Pt. 9, ratio	2: 11, 3: 30	Trait 7
Credulous or suggestible	Pt. 11	2: 6, 3: 60, 5: 5, 7, 16	
Objective or universal in their verbal ass'ns.	Kent.-Ros. com- monality		
Careless of details	Pt. 7		
Deficient in fine motor coordination	Pt. 2 and Pt. 8		
Less conceited	Agreements between checks in Pts. 3 and 9		
Persevering	Pt. 6, letters		

How these differences in personality arose cannot be answered in detail by examining the answers to the questionnaires. The possible explanation of the factors which operated to place the men in the opposing extremes of occupation and personality are as follows:

(1) The mechanically inclined men were more often of non-American or non-British extraction. Not being of the same stock

as the majority of the inhabitants of the country, and not having the advantages of training by parents of that stock, they were handicapped in their adaptation to society and tended therefore to enter occupations where mechanical rather than social ability was of prime importance.

(2) The early family history of the mechanically inclined men points to a less healthful and cheerful environment than that of the salesmen. The indications are that the mechanics students were dissatisfied with the financial status of their families, the characteristics of their companions, and the generally cheerless tone of their environment. They tend to claim they were treated worse than their brothers and sisters, and engaged in more fist-fights than the salesmen.

(3) Maternal influence was exerted predominantly on the mechanically inclined men and paternal influence on the salesmen. How these influences shaped their personality is an obscure psychological problem. Without going unnecessarily deeply into the possible psychoanalytic explanation, the conclusion seems warranted that the mechanics student was very early rebuffed by his human environment, owing perhaps to a greater mechanical than social intelligence, and subjected himself largely to the influence of the person who naturally took the deepest interest in him,—his mother. The mother's influence may have caused him to become less vigorously adapted toward society, but a more plausible interpretation of the facts is that the same factors which caused in the mechanics student an attachment to his mother, gave rise to his personality traits and caused him to enter a mechanical occupation. The influence of the mother may be accepted as an intensifying factor in shaping personality, and as subordinate to the fact that a greater proportion of the men were of foreign stock and in general grew up in a less fortunate environment than the salesmen. There is nothing to indicate that race is responsible for choice of occupation or for personality differences such as we have been studying. We should probably find socially inclined and mechanically inclined individuals distributed in the same proportions in every race and nationality, but we should also expect to find among a submerged minority of different stock a greater proportion of men

of mechanical inclinations, simply because they have not the training, appearance, and other qualities necessary to exert social influence. In America, especially, there is a marked tendency to look with distrust on foreigners or those bearing foreign names.

(4) There remains, however, a large per cent of men of mechanical tendencies who are of native stock. The explanation given in the preceding paragraph will not account for the differences between them and the salesmen. The most suitable explanation is to describe them as lacking in social ability and possessing mechanical ability, and the salesmen as possessing social ability and lacking mechanical ability. Thorndike (21) postulates three kinds of intelligence: mechanical, social, and conceptual, represented among others by mechanics, salesmen, and engineers, respectively. The mechanics students may dominate in mechanical intelligence and be weak in social intelligence, and the salesmen display the opposite tendency. It is the writer's belief that conceptual intelligence is not of a distinct sort, but displays itself in both mechanical intelligence and social intelligence. Social intelligence may be conceived as the ability to manipulate human beings so as to accomplish definite ends, in contradistinction to mechanical intelligence, which is the ability to manipulate machines. But conceptual intelligence is demanded in both of these processes. Social intelligence and mechanical intelligence are the only ones which may be distinguished behavioristically. Social intelligence is perhaps best illustrated by pointing to the politician, the orator, or the salesman. The machinist or the draftsman illustrate the possession of mechanical intelligence. The reactions of human beings and machines are of not quite the same nature, and require a different technique. On its passive side, social intelligence is shown in social suggestibility, identification with the crowd in associations and beliefs, in susceptibility to "being sold," in apparent credulity. The credulous person, or the person who appears to be credulous, is more apt to make a favorable impression on others than the person who is open in his disbeliefs.

(5) At least one of the traits displayed by the mechanics students may be compensatory in nature. I refer here to conceit, apparently measured by the means explained in Chapter II, and also

shown in the statements of the industries students that they won a majority of the fights they engaged in as children. A realization on the part of many of the mechanics students that they lacked certain of the elements of social ability may have wittingly or unwittingly caused them at least to assume the attitude of possessing those elements. Conceit is a typical compensatory attitude. Incredulity may in a sense be compensatory. It is an attitude assumed by those who realize their weaknesses and are consequently on guard that no one takes advantage of them. It is less easy to find examples of compensation among the salesmen, since it is a lack of social adaptation that is usually compensated for. Lack of mechanical ability would be less often a cause of social mal-adaptation than lack of sociability, and it is the realization that one is socially poorly adapted that gives rise to compensation. Perseverance on the part of the salesmen may possibly be a compensatory mechanism, and their lack of conceit may well be considered as over-correction lest they be judged as conceited in the slightest degree.

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